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AMERICAN MACHINIST

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APR 5 • 1943

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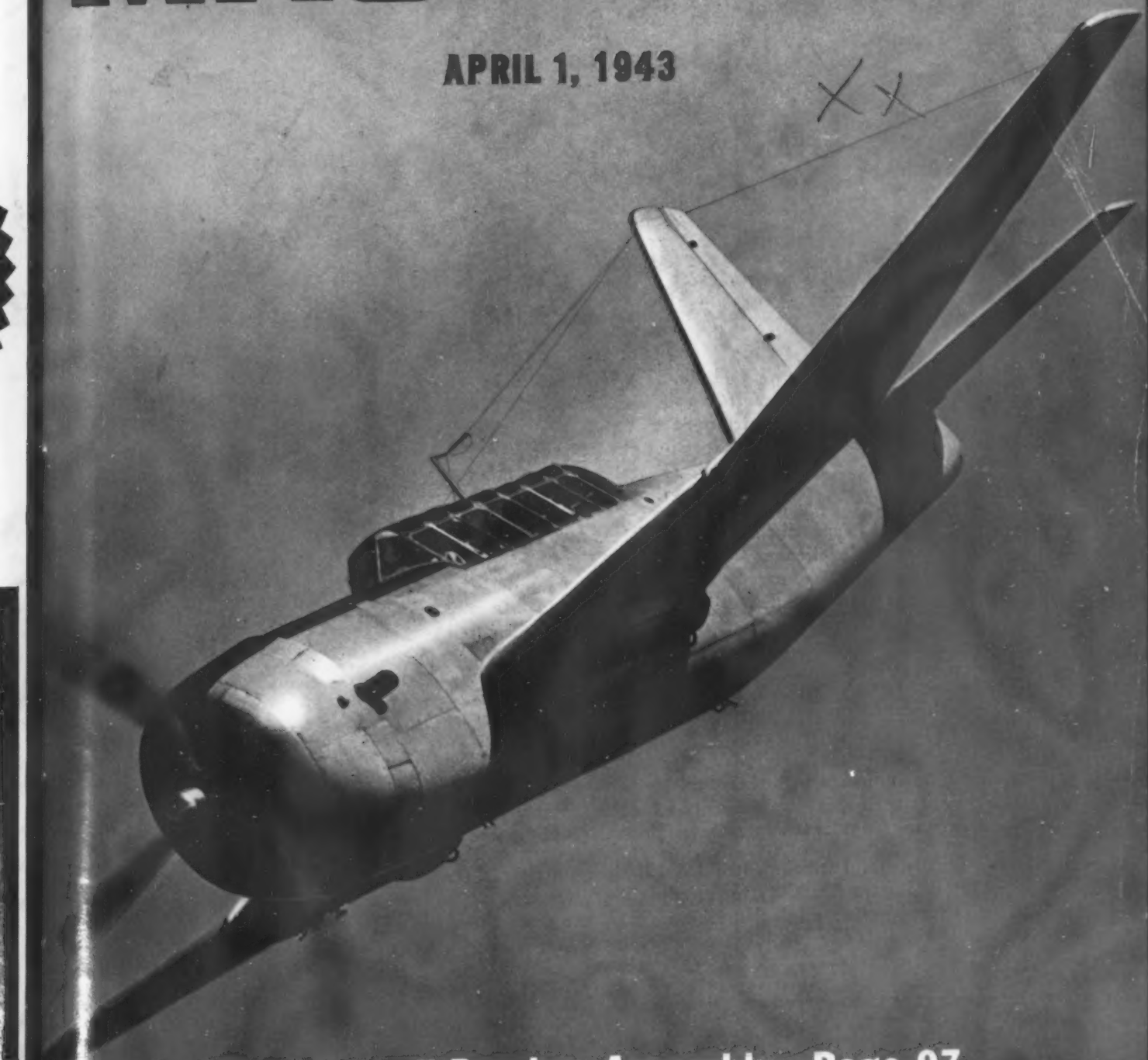
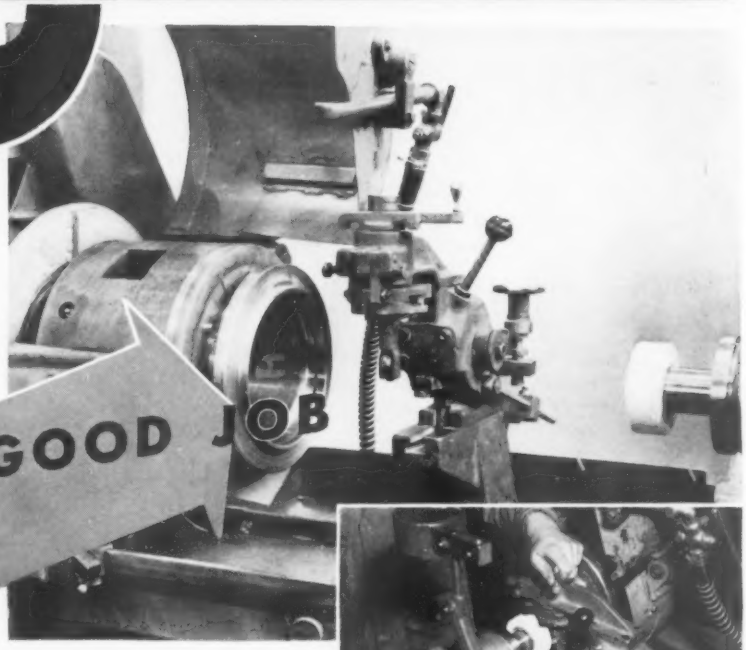


"Vengeance" Bomber Assembly—Page 97

THIS MIGHT GET YOU OUT OF A JAM

In truing Radii and Angles



BUT FOR A GOOD JOB

YOU'LL WANT THE HEALD UNIVERSAL DIAMOND

If the work ground on your Heald No. 72A Plain Internal is all straight-hole grinding the standard truing diamond is exactly what's required to do a good job of wheel truing. But if you have work that involves grinding of radii and tapers as well as straight surfaces, the standard diamond of course will take care of straight truing but not radii or tapers.

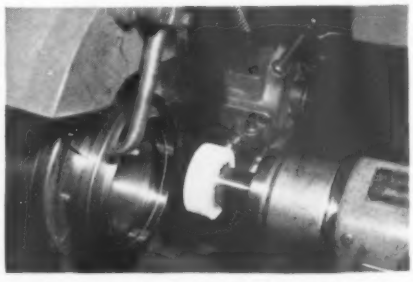
For truing wheels to special shapes two different methods can be employed. One method requires no more equipment than an abrasive stick, but should be considered only as a temporary expedient. Using this method the operator holds the stick in his hand and manually trues a radius or chamfer on the corner of the wheel, using a template for checking contour. Even with an experienced operator this is a cut and try procedure and consequently is inaccurate and slow.

The recommended process, if you want speed and accuracy in truing special shapes, is to replace the standard diamond unit with the Heald Universal Diamond. This truing device consists of a basic unit which can be furnished with three quickly interchangeable diamond attachments each specifically designed for the separate operations of radius truing, angular truing, and straight truing as illustrated.

Here's a really useful attachment which will give your Heald No. 72A Plain Internal extra flexibility for grinding a greater variety of work. Can be furnished as original machine equipment or supplied for attaching in the field.

The Heald Universal Diamond arranged with radius truing attachment. Trues wheel radii from 0 — 2½".

Heald Universal Diamond equipped with angular truing attachment. Trues wheel angles from 0 — 90°, has 1¼" stroke.



Heald Universal Diamond with straight truing attachment.

THE HEALD MACHINE CO. WORCESTER MASS. U. S. A.

AMERICAN MACHINIST

April 1, 1943

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AMERICAN MACHINIST *chips*

BACK IN SERVICE . . . Veteran readers of these pages may recall (with, we hope, at least a tiny twinge of pleasure) the column of yesteryear called "Chips". It has been suggested that we revive this feature, so here it is.

We shall attempt to make "Chips" an informal collection of odds-and-ends interesting to management and production executives; a forum in which you are invited to speak your piece; an outlet for some of the many interesting ideas and nuggets of news which flow through a publishing office. And if it's OK with you, we'll probably mix a little fun with business. Even those hard at work on war production can use a chuckle once in a while.

Anyway, we hope you'll like it and we'll be glad to hear from you at any time.

War-Winning Ideas . . . Frequently, readers write in to describe ideas they have developed to short-cut a war production job. It may be a new attachment, or simply a new method of utilizing present equipment to better advantage. If you have such an idea, and want to spread the good word along to Metal-Working, write to Miss Esther Rosenblatt, Editor, Awards Branch, War Production Drive Headquarters, War Production Board, Washington, D. C. Miss Rosenblatt can give you all information regarding the submission of "War-Winning Suggestions."

o

Far West Trek . . . If you live in the Pacific Coast area, chances are you've seen more of Jack Haydock, Managing Editor of *American Machinist*, than we have here at home. For over a month, Jack has been journeying from the Northwest to Texas, visiting many of the leading shops in that part of the country. As a result of this Odyssey, you can expect in coming issues of *American Machinist* a wealth of up-to-the-minute, practical production data . . . particularly concerning aircraft production.

o

A Stone In Time Saves . . . A. J. Sidford, V.P. of Behr-Manning, pens a plea for more consideration of a simple way of saving time and steel. He says, in part, "There is more irreplaceable high-speed and cemented carbide tool steel wasted by too frequent grinding than should occur. It is sheer waste to grind these tools frequently when touching up with a good oilstone right at the operating machine—at the first sign of dullness—will keep the tool cutting efficiently." Thanks, Mr. Sidford. Many readers may want to remind their workers of this tip.

o

Take a Number From 1 to 300 . . . Some readers wrote in last year asking that our pages be numbered consecutively by issue, rather than having the editorial section numbered separately. You've probably noticed that beginning in January of this year, pages start from No. 1 each issue and run straight through. Although there was what we thought a pretty good reason for the other system, this is, after all, *your* magazine . . . and what you want we try to give.

o

War Department to Editor . . . "Dear Sir. We would appreciate having 500 reprints (of article 'Glass for Precision Gages', Feb. 4 issue) for distribution to the various concerns and individuals interested in the development of glass gages". *(Note: Reprints were mailed, and some are still available if others want them).*

o

Brother, Can You Spare a Copy? . . . Knowing you have plenty of your own problems, we hate to burden you with one of ours. But here goes: The shortage of paper has forced us to economize in many new and unfamiliar ways. For one thing, we've had to put a ceiling on the number of copies we print each issue. This, in turn, has meant that some applications for new subscriptions have to be deferred until there is room on our circulation list.

We're sorry if you, Mr. New Reader, have been unable to start getting copies of *American Machinist* as soon as you would have liked.

And to other subscribers, as you get each issue would you share it with any men who are still waiting? We want every copy to get around and do its best in every shop, so that we may serve the most people in Metal-Working. Thanks, brother.

Save Time With Standardized Design . . .

use the new, revised

GLEASON SPIRAL BEVEL GEAR SYSTEM

(1943 edition)

102 pages of tabular ready-to-use data

This new book will save hours of valuable time for your gear engineers. It contains 102 pages of spiral bevel gear tooth proportions, already computed and ready to use. The new forward gives the bases and formulas of the system, and fully explains the most recent, important changes in this field of design.

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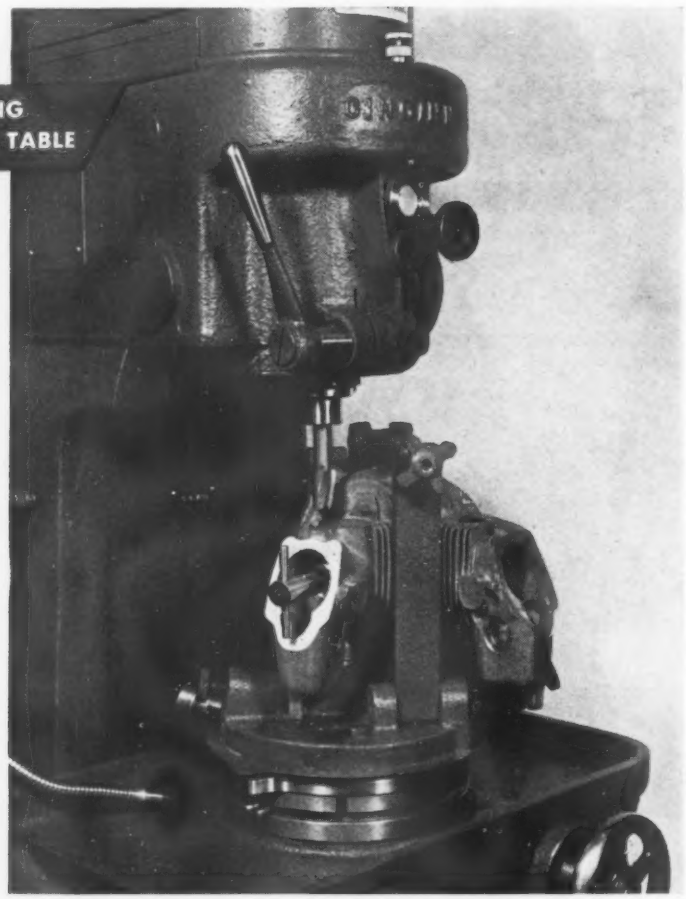
ARMY E NAVY

MASTERS OF PRODUCTION BEST DESCRIBE . .

CINCINNATI 0-8 VERTICAL MILLING MACHINE WITH POWER ROTARY TABLE



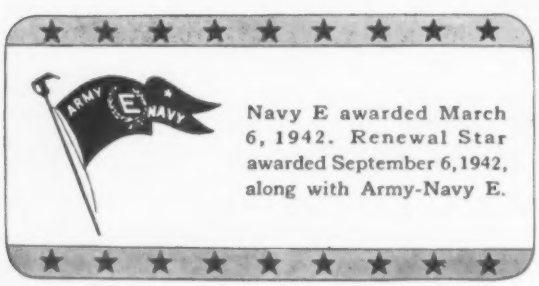
Milling intake pad of aircraft cylinder head

This is an engineers' war. Outsmarting the enemy on the production line is just as important as outmaneuvering him on the battlefield. And to the engineers here at Milling Headquarters has fallen a major part of the job of developing machines and methods which will turn out the needs of a wartime America in quantities greater than we ever dreamed possible.

Today CINCINNATI Milling Engineers and Craftsmen are designing and manufacturing milling machines that will outproduce and outperform practically all previously built machines . . . machines that are unquestionably Masters of Production.

You are urged to consult CINCINNATI Engineers about your milling worries. Don't hesitate to take advantage of this service. And be sure to investigate fully the adaptability of CINCINNATI Milling Machines to your requirements.

Sweet's Catalog File contains a brief description of all machines built by this company. Look it over. Then let us know which of these machines are of especial interest to you. We shall be glad to send complete details and specifications.



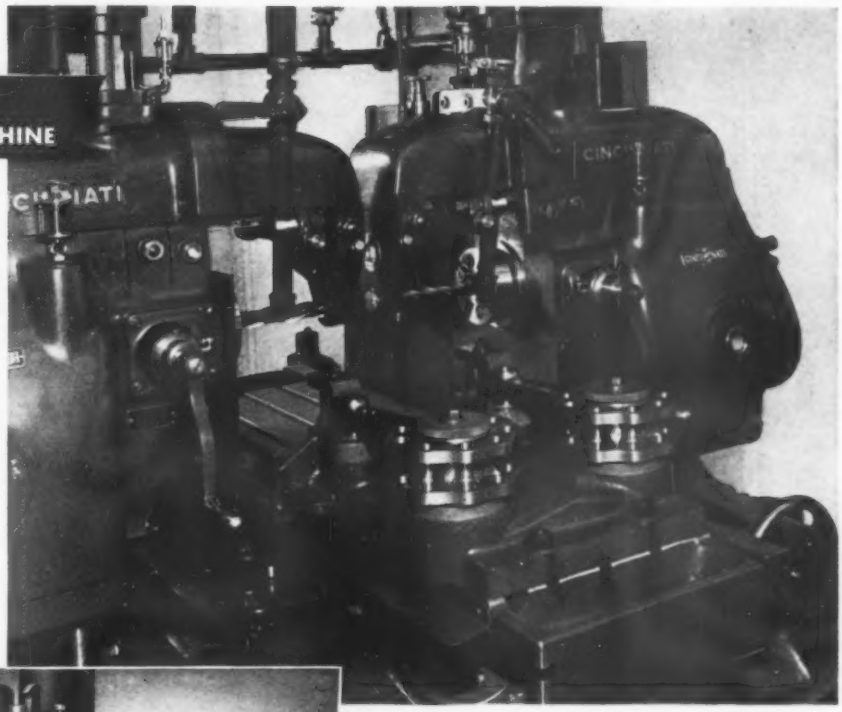
Navy E awarded March 6, 1942. Renewal Star awarded September 6, 1942, along with Army-Navy E.

THE CINCINNATI

MILLING MACHIN

. . Cincinnati Milling Machines

**NCINNATI No. 34-36 DUPLEX TRACER
ONTROLLED HYDROMATIC MILLING MACHINE**



Part: Master rod — aircraft engine.

Operation: Rough and finish mill edges of I section.

Production: 5½ complete parts per hour.

**CINN . 2-24 AUTOMATIC RISE
ND F LLING MACHINE**

Rough milling inside of end connections for tank tracks. Machine is equipped with a cam roller attachment for the purpose of producing the profile shape required by these parts.

CINCINNATI

T MILLING MACHINE CO. CINCINNATI, OHIO, U. S. A.

BROACHING MACHINES • GRINDING MACHINES • LAPPING MACHINES

PRODUCTION INSPECTION BY OPTICAL PROJECTION

Some of the many and varied parts inspected by Jones & Lamson Optical Comparators.

Photo courtesy The Eastern Machine Screw Corporation.

Comparison Inspection of production parts and products with **Jones & Lamson Optical Comparators** sets new standards for speed and accuracy in production inspection.

The most complex forms can be inspected with a rapidity and precision, unobtainable by other methods, by operators with a minimum of training or experience.

There is a **Jones & Lamson Optical Comparator** for every need in the field of inspection by optical projection, and our inspection engineers are ready to study your inspection problems and make recommendations based upon more than twenty years experience in this field.

JONES & LAMSON
MACHINE COMPANY

Manufacturers of • Universal Turret Lathes • Fay Automatic Lathes
Automatic Thread Grinders • Optical Comparators • Automatic Opening
Threading Dies

Springfield, *Vermont,* U. S. A.

SADDLE TYPE
UNIVERSAL TURRET LATHES

PROFIT-PRODUCING
MACHINE TOOLS

RAM TYPE
UNIVERSAL TURRET LATHES

Photo by U. S. Army Signal Corps

WAR PRODUCTION BULLETIN

In certain devices requiring
TINY GEARS and PINIONS
of ZERO BACKLASH PRECISION
Fellows machines produce the requisite quality on a mass production basis...Machines employed are: Gear Shapers, Gear Finishing Machines and Burnishing Machines.

FELLOWS

MACHINES AND TOOLS FOR GEAR PRODUCTI

ARS Accurate

S THEIR USE IS SECRET

Tiny gears and smaller pinions are built into mechanisms whose precision is projected at targets thousands of feet aloft. Lives depend upon their accuracy, and the unimpeded smoothness of their functioning . . . Specifications are as rigid as can be imagined—in fact, they are made with zero backlash. This is a gear job for which the Fellows Method is admirably suited. These gears are cut on the Straight Line Gear Generator, and burnished on the No. 4B Fellows Gear Burnishing Machine. If you are cutting or planning to cut small fine-pitch gears, it will pay you to investigate the possibilities of these machines, for descriptive circulars, write: The Fellows Gear Shaper Company, Springfield, Vermont—or 616 Fisher Bldg., Detroit, Michigan, or 640 West Town Office Bldg., Chicago, Illinois.

ght-Line Gear Generator

No. 4B Gear Burnishing Machine

Method

. . . . FROM BLANK TO FINISHED GEAR

Masters of production best describe

CINCINNATI

CINCINNATI 10" Plain Hydraulic Grinding Machine. Specification catalog No. G-490 gives complete details on all features and benefits.

Navy E awarded March 6, 1942. Renewal Star awarded September 6, 1942, along with Army-Navy E.

CINCINNATI GR

CINCI

CENTER TYPE GRINDING MACHINES ENTER

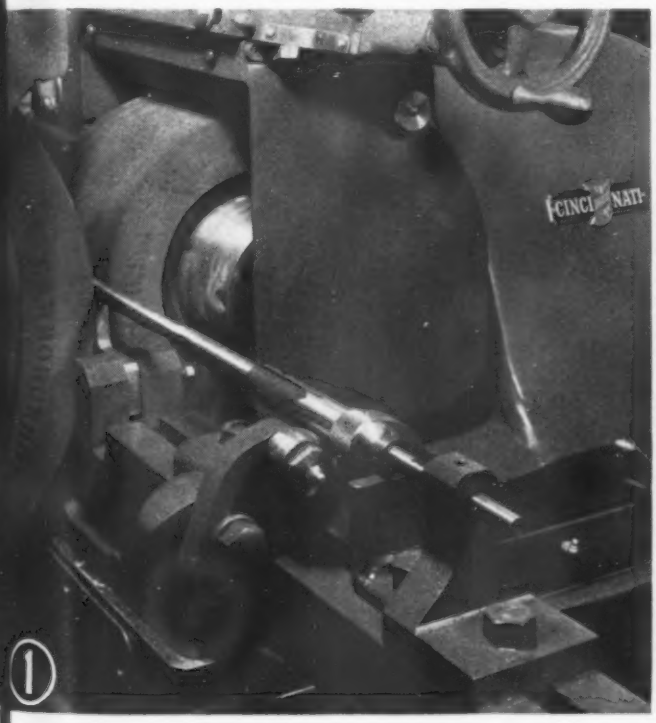
CINCINNATI GRINDING MACHINES

Working for you here at Grinding Headquarters is a group of technical experts whose sole function is to develop machines and methods to handle your grinding more accurately, economically, in less time, and with a minimum of operator fatigue.

This staff of field and factory engineers is anxious to be of service to you in the solution of your grinding problems, and to recommend better methods for handling specific operations. If there is *anything* you want to know about cylindrical grinding, enlist the services of these authorities.

The increasing demand for and the universal use of the grinding machines produced by this company are evidence of their high quality, dependability and usefulness, and of the exceptional skill of the engineers here at Grinding Headquarters. CINCINNATI Grinders are truly Masters of Production. You'll want to learn more about them.

Sweet's Catalog File contains a brief description of all CINCINNATI Grinding Machines. Look it over. Then tell us the machines in which you are interested, and we shall send more information.



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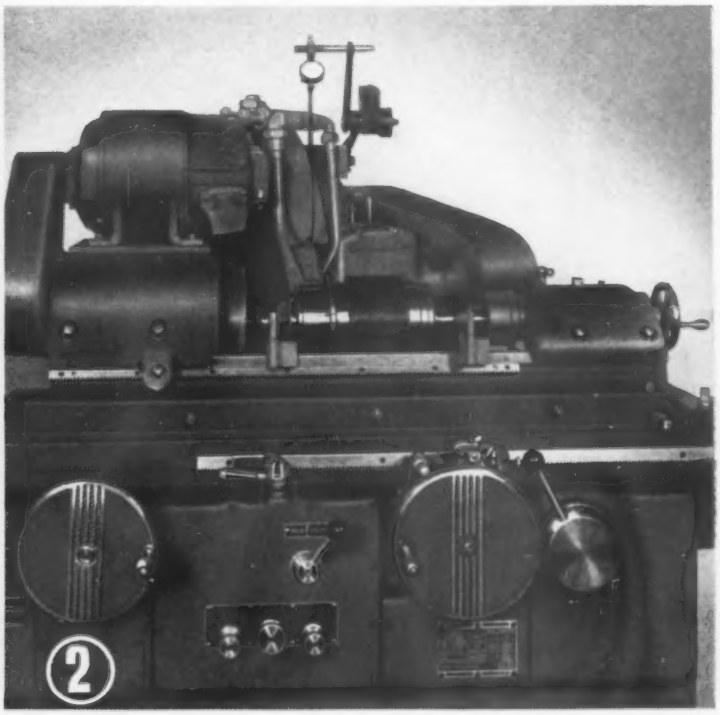
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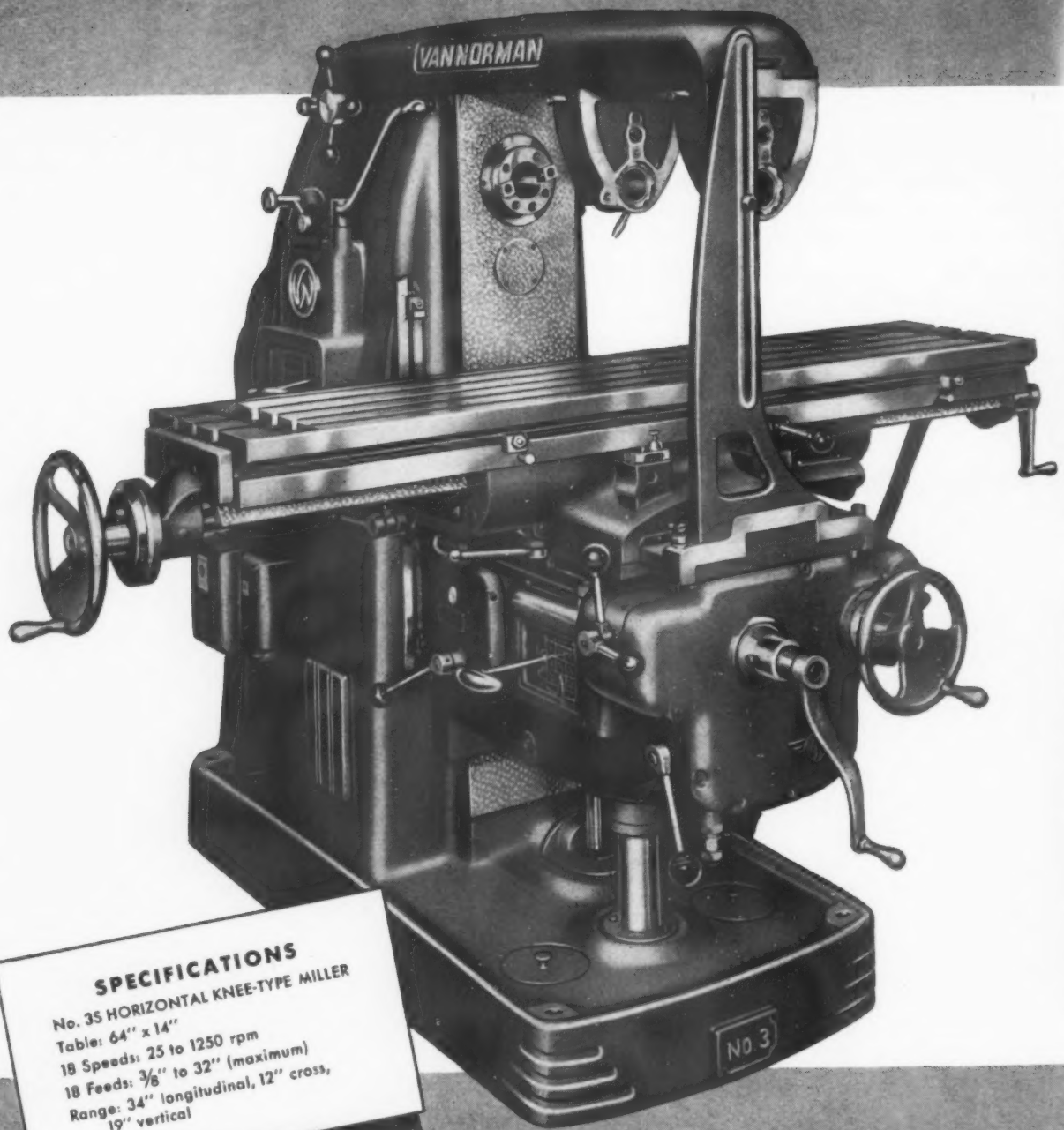
GRINDERS INCORPORATED

CINCINNATI, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

★Front and Rear Directional Co



SPECIFICATIONS

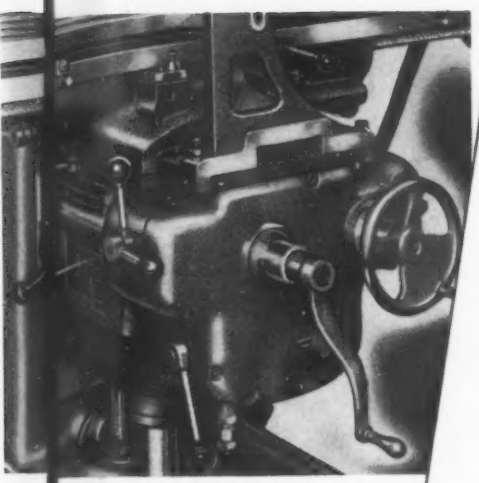
No. 3S HORIZONTAL KNEE-TYPE MILLER
Table: 64" x 14"
18 Speeds: 25 to 1250 rpm
18 Feeds: 3/8" to 32" (maximum)
Range: 34" longitudinal, 12" cross, 19" vertical

ARMY E NAVY

VAN NORMAN MACHINE TOOL CO

SPRINGFIELD, MASS.

Controls on Van Norman Millers



★ FRONT CONTROLS

★ REAR CONTROLS

CONSERVE MAN HOURS
LESSEN IDLE MACHINE TIME
SPEEDS OUTPUT

A full set of directional controls of all power feeds for table, knee, saddle, as well as 6-way rapid traverse, are conveniently grouped in both the front and rear of Van Norman Milling Machines to provide additional ease and convenience of operation. This Van Norman feature enables the operator to do most milling operations from one position . . . either the front or the rear of the machine. The valuable time saved by minimizing unnecessary operator movement from one side of the miller to the "feed control" position lessens worker fatigue and increases the operator's and machine's productive capacity.

In addition, directional control means that all power feed controls operate in the direction of desired table, knee or saddle movement. 18 changes of feed are instantly available through the exclusive Van Norman Single Lever Speed Selector which is readily accessible from both the front and rear operating position. Hand cranks and wheels automatically release when not in use. Automatic-reset safety clutch in the large and heavy knee eliminates strain on any unit of the mechanism should an overload occur. These plus other Van Norman features provide faster, easier, more accurate operation.

COMPANY

The LANDMACO
(Hand Operated)
SHELL TAPPER

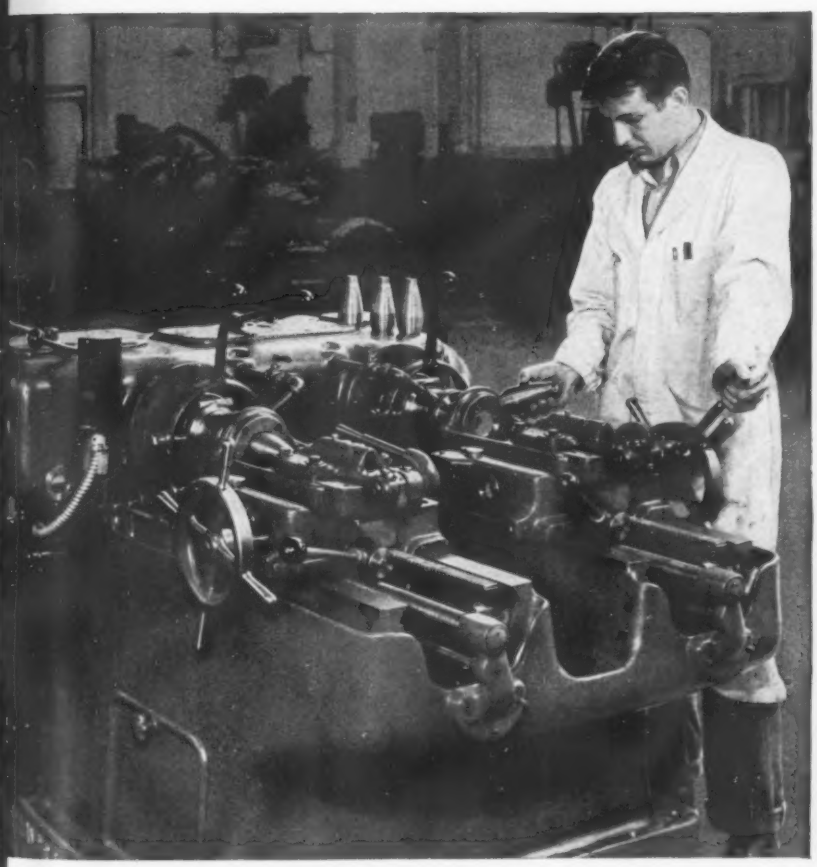
The precisely built Landmaco HO (Hand Operated) Shell Tapper is used extensively by the manufacturers of Mortar Shells and similar small projectiles. The inherent qualities—productivity, accuracy, and rigidity—built into all Landis products assure the high production, with minimum rejects, necessary to provide our armies with the material to carry on.

LANDIS

BOLT THREADING MACHINES

SPEEDS PRODUCTION OF TRENCH MORTAR SHELLS

One mid-western manufacturer of 81 mm. Mortar Shells employs the Landmaco Shell Tapper exclusively for handling the vital internal threading operations of this important "Weapon of War." The threads are well within the required close tolerances. The production ample to guarantee maximum daily output.



THE LANDIS CHASER

LANDIS LT COLLAPSIBLE TAP

Write for Booklet "Precision in Munitions Threading"

MACHINE CO. WAYNESBORO PENNA. U.S.A.

COLLAPSIBLE TAPS DIE HEADS PIPE THREADING MACHINERY

"AMERICAN"

FOR ALL-OUT PRODUCTION

HOLE WIZARDS ARE MEETING THE CHALLENGE

"American" Hole Wizards are meeting the 24 hour production challenge of our shipbuilding schedule without a whimper. Day in and day out in our Navy Yards and Shipbuilding plants they are drilling, boring and tapping at top speed and at the same time maintaining amazing standards of accuracy.

Shipbuilding plants that have established records for launchings are using "American" Radials.

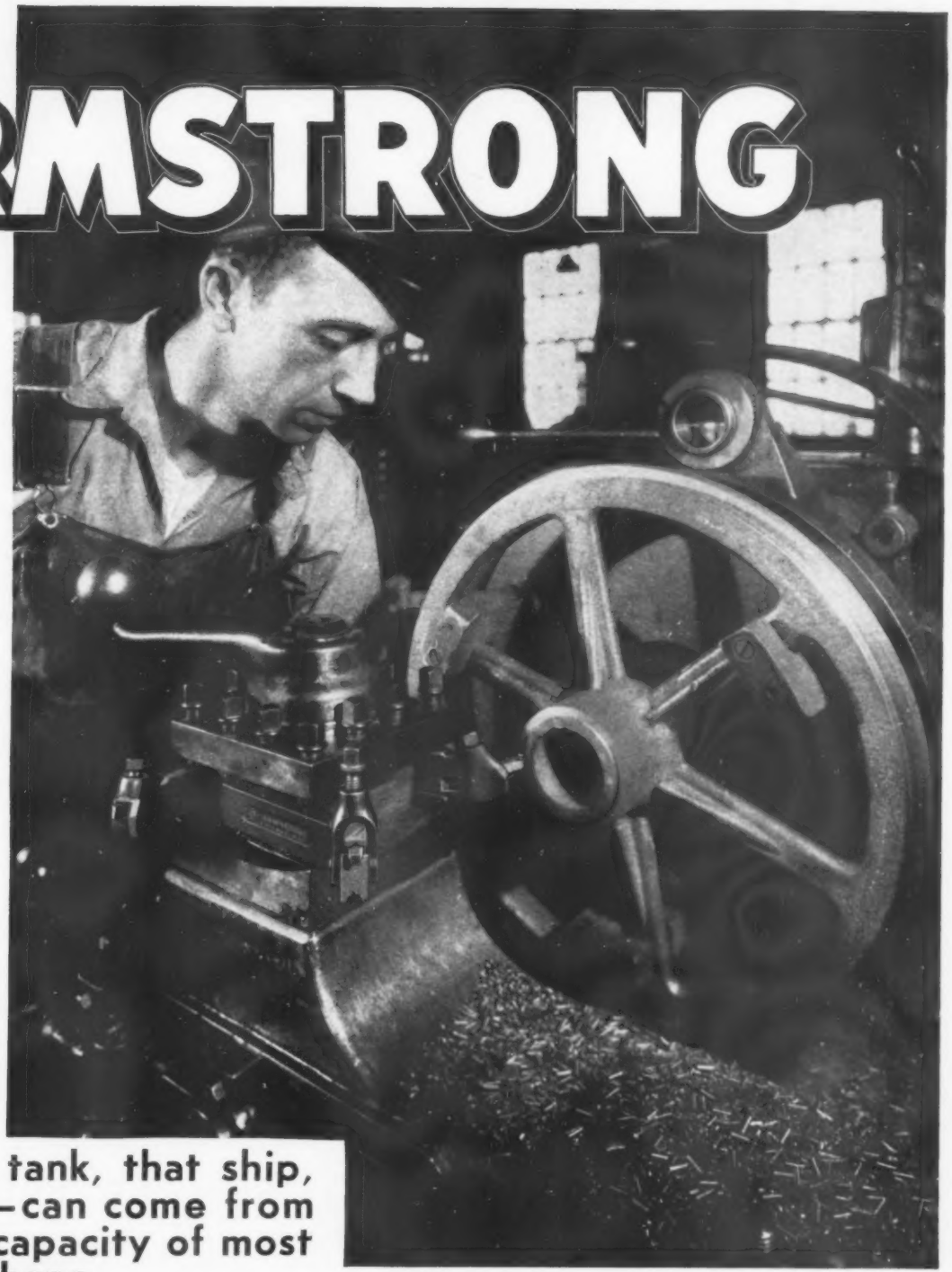
THE AMERICAN TOOL WORKS CO.

CINCINNATI, OHIO, U.S.A.

LATHES RADIALS SHAPERS

"AMERICAN" *Hole Wizard* RADIALS

ARMSTRONG



"That extra tank, that ship, that plane"—can come from the unused capacity of most shops

Even today when our most important job is to make every machine-hour and man-hour produce more, many shops are still content to operate machine tools at "standard" speeds and feeds. In most cases on lathes, planers, slotters and shapers these so called "standard" cutting speeds are carry-overs from the old forged tool days, are in no way indicative of the productive capacity of machine tools equipped with modern ARMSTRONG TOOL HOLDERS.

If you are having trouble getting out your part of the war load, are "short" of either men or machine tools, you may find the answer to your problems in higher speeds and feeds. See that you have the correct ARMSTRONG TOOL HOLDER for each operation, then speed up, not only to the first "vibration point" but often beyond it you will find new free cutting speeds that can greatly increase (often double) hourly production. Remember, your ARMSTRONG TOOL HOLDERS will stand up to any output a machine tool can attain.

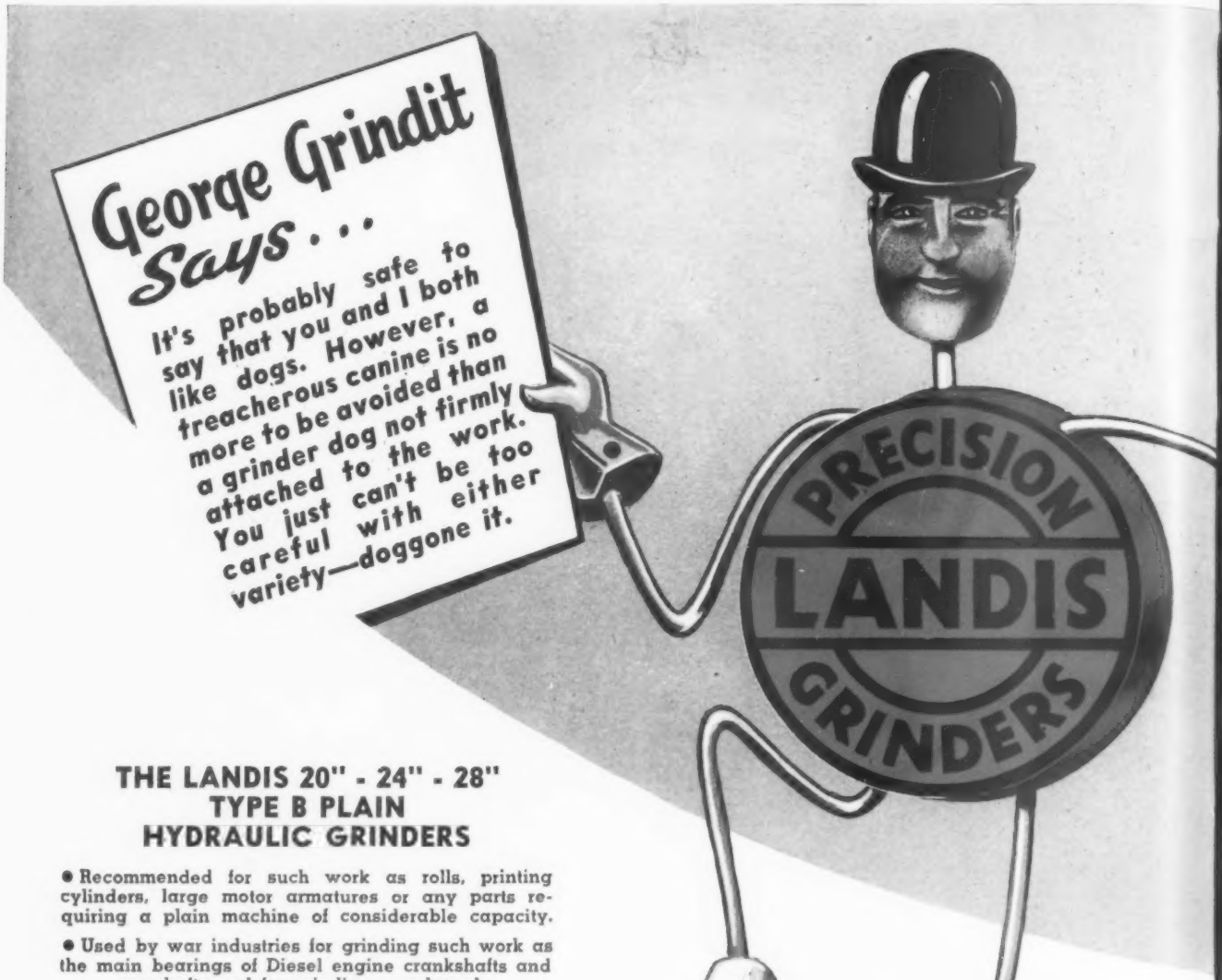
ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

315 N. FRANCISCO AVE. CHICAGO, U.S.A.

Eastern Warehouse and Sales:
199 Lafayette St., New York

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms


George Grindit
Says . . .
It's probably safe to say that you and I both like dogs. However, a treacherous canine is no more to be avoided than a grinder dog not firmly attached to the work. You just can't be too careful with either variety—doggone it.
PRECISION
LANDIS
GRINDERS

THE LANDIS 20" - 24" - 28" TYPE B PLAIN HYDRAULIC GRINDERS

- Recommended for such work as rolls, printing cylinders, large motor armatures or any parts requiring a plain machine of considerable capacity.
- Used by war industries for grinding such work as the main bearings of Diesel engine crankshafts and camshafts and for grinding gun barrels.
- Available in lengths ranging from 96" to 192".

IF YOU HAVE A GRINDING PROBLEM

Let George do it

LANDIS TOOL COMPANY

IT'S ALL HERE

How well I remember the look in that young man's eye. He had just ducked a piece of work which flew out of the grinding machine he had started to operate several days previously. It was his first acquaintance with the possible consequences of neglecting work drive dogs. Our easy-to-read book "Better Grinding" tells all about both drivers and dogs in its second chapter. Mail in the coupon below and take my assurance that this second chapter, plus the other seventeen, will make mighty instructive and interesting reading.

THE CHAPTERS

Work Centers and Centers in the Work . . Work Drivers and Driving Dogs . . Work Rests . . The Diamond . . Wheel Dressing and Wheel Truing . . Mounting and Balancing the Wheel . . Grinding Wheel Coolant . . Lubrication . . Multiple V Belt Drives . . Wheel Spindles and Bearings . . Grinding Wheel Feed . . Grinding Wheel Width . . Speed of Work Carriage Traversal . . Work Speed . . Grinding Wheel Speed . . The Grinding Wheel . . Chatter . . Miscellaneous Bits.

Please Send Me a Free Copy of . . .

"BETTER GRINDING"

_____ NAME

_____ ADDRESS

_____ COMPANY

No. 2 _____ CITY

Please Print Above and Send To

LANDIS TOOL CO.

WAYNESBORO, PENNSYLVANIA

WAYNESBORO, PENNSYLVANIA

Sabotage?

...EVERY MACHINE TOOL IS EXPOSED TO THIS MENACE

YES — "sabotage" is ever present even with every machine running smoothly — in step with the swift pace of wartime production — "Sabotage" in the form of excess wear in closely fitted parts — bearings — gear trains. And wear quickly shortens the production life of the machine tool — impairs accuracy — takes it out of action.

Such wear is most likely to occur under the peak loads of high production, unless the machine tool is equipped with self protection — adequate and automatic lubrication of all vital parts.

Automatic lubrication in Milwaukee Milling Machines is assured by pressure pumps in the column and knee of horizontal machines and in the sliding head of vertical machines. Only a minimum of attention is needed to keep the machine at full lubricating efficiency.

Buy Victory with at Least 10% in War Bonds

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CORPORATION
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Milwaukee **MACHINE TOOLS**

For *Victory*

and For Your Future...

BUY WAR BONDS AND STAMPS!

Your Home...

War Bonds and Stamps provide a good way to save for the home you have always wanted to own.

Your Children's Education...

War Bonds and Stamps — a good way to lay aside funds for educating your children.

A New Car For Your Family...

Save now with War Bonds and Stamps for that new car you will want to buy when the war is over.

V '43 FOR VICTORY

***Buy* VICTORY WITH AT LEAST 10% IN WAR BONDS**

JUST LIKE A LECTURE ON THE FUNDAMENTALS OF MILLING...

...This Handbook on the "Right and Wrong of Milling Practice"

Even experienced milling machine operators find this handbook useful and valuable in brushing up on the fundamentals of sound milling practice.

Written in an easy-to-understand style — contains hundreds of illustrations depicting the right and wrong way of operating a milling machine — plus many valuable suggestions on short cuts in milling — and the correct care and attention of the machine.

Write for your personal copy of the newest Kearney & Trecker publication, "The Right and Wrong of Milling Practice".

Kearney & Trecker *Products* CORPORATION
MILWAUKEE, WISCONSIN
Subsidiary of Kearney & Trecker Corporation

Kearney & Trecker CORPORATION
Milwaukee, Wisconsin

THE ANSWER TO THE GRINDING OR HONING PROBLEM
THAT HAS BEEN RETARDING YOUR PRODUCTION
FREE! MAY BE FOUND IN THIS HELPFUL LITERATURE **FREE!**

Send for it TODAY
. . . it's FREE!

In addition, you are cordially invited to use our engineering service.

Let our trained abrasive specialists solve your problem for you
. . . THAT'S ALSO FREE!

Mid-West

FOR VICTORY
BUY UNITED STATES WAR BONDS AND STAMPS

MID-WEST ABRASIVE COMPANY

Manufacturers of DEPENDABLE Abrasives

1960 E. MILWAUKEE AVENUE DETROIT, MICHIGAN

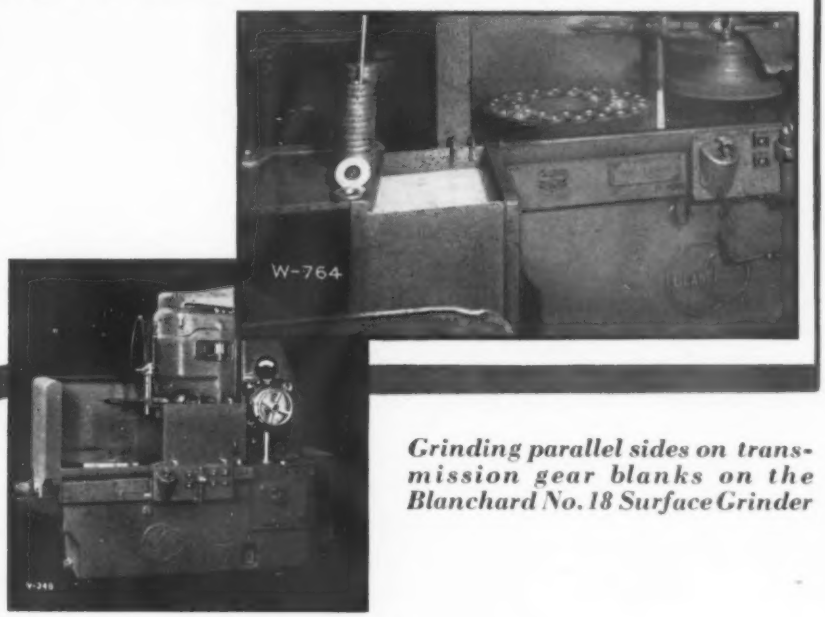
MID-WEST ABRASIVES

"PUT IT ON THE BLANCHARD"

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

- ★ **Production**
- **Adaptability**
- **Fixture Saving**
- **Operation Saving**
- **Material Saving**
- **Fine Finish**
- ★ **Flatness**
- ★ **Close Limits**

★ . . . . . *Especially valuable on jobs like the one illustrated.*



Grinding parallel sides on transmission gear blanks on the Blanchard No. 18 Surface Grinder

THE transmission gear blanks, shown above, are ground on a Blanchard No. 18 Surface Grinder. They are held on the 30″ Blanchard magnetic chuck. The blanks are 3½ inches in diameter and are made of forged alloy steel. .020 inches of stock is removed from each side to limits of .0005″ for parallelism. Blanchard Grinding produces accurate blanks that stack and cut well—and produces them at a rate of 250 (500 surfaces) per hour.

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE, MASS.

BLANCHARD

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

THEY COULD USE THIS

THAT HALF-TRACK can be mighty useful, on a farm or construction job. It can save time and back-breaking work, in a hundred and one ways. The men in our armed services realize it. They're waiting for a chance to use it, back home.

OTHERS SEE the utility of planes, jeeps, powerful trucks for peacetime pursuits. Homemakers will clamor for better equipment for comfort and convenience. And they'll have the money to buy, invested in War Bonds or otherwise.

BUT they'll be cagey shoppers, we think. They won't be satisfied with the old. They'll be looking for manufacturers to apply the lessons of war to peacetime goods. The pressure now is for deliveries. The postwar demand will be for more over-all utility, at a fair price.

WE DOUBT that this country's present machinery will do the job. Much of it is years old, depreciated even before the War. Heavy loads and long hours have reduced the value of new machines. New developments will cause a high degree of obsolescence, even of equipment still in good order.

SO, the manufacturer will be a jump ahead of his competitors, who starts now to study his postwar facilities. He'll find out what machinery he can use, what is outworn or outmoded. He'll plan to use the most productive machinery he can obtain.

TAX AUTHORITIES CAN HELP, by considering the rapid rate of depreciation and obsolescence, and by permitting the reservation of "seed money" so that funds will be available when new equipment is obtainable.

WE SHALL LOSE MUCH of the value of our native ingenuity if we are not ready to apply it to peacetime pursuits. Only the production of more goods for more people, by means of modern machinery, can bring us work, contentment, and lasting freedom.

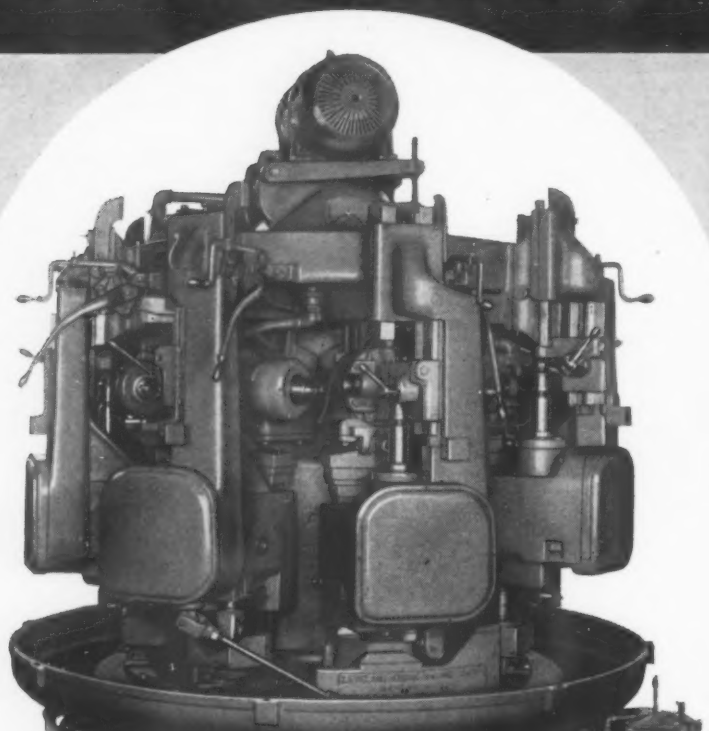
THE MONARCH MACHINE TOOL COMPANY · · · SIDNEY · OHIO

MONARCH LATHES

Cover the Turning Field

back on the FARM

The 8 SPINDLE ROTARY RIGIDHOBBER.



MODEL 220

FOR MAXIMUM PRODUCTION OF PRECISION GEARS AND SPLINES

On the Rotary Rigidhobber eight spindles operate simultaneously. Operations on each of the eight spindles are performed independently of each other during continuous rotation of the 8 spindles on the machine base. The operator merely loads and unloads the work at the loading position —all operations being fully automatic.

Close accuracy and absolute duplication is obtained by rigid support of the work both above and below hob during entire operation.

The 8 spindle Rigidhobber handles work up to 6" dia. and 13" long. Also built in single spindle models No. 140 and 145.

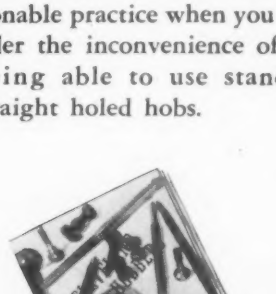
Consult a Cleveland Hobbing Engineer on increasing production and lowering costs on your hobbing operations.

Full descriptive bulletin available on request.

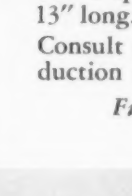
HOBBING HELPS *for Boosting WAR Production*

THE HOB ARBOR is a Precision Job

The standard size hob arbor is 1¼" diameter. However various sizes may be used from ½" up to 4" depending upon the diameter of the hob. The majority of the hob arbors are straight. The diameter upon which the hob fits should be ground to a tolerance of not more than .00015. The hob should be a good fit on the arbor and after being assembled must not run out more than .0003". Some hob arbors are made to accommodate tapered hole hobs, but this is a questionable practice when you consider the inconvenience of not being able to use standard straight holed hobs.

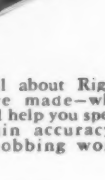


This booklet tells all about Rigidhobbers—how they're made—what they do—how they will help you speed production—maintain accuracy—and cut costs on hobbing work.



The CLEVELAND HOBBING
Cleveland .... MACHINE Company ... Ohio

BUILDERS OF RIGIDHOBBERS AND RIGIDTURNERS



Prelude

TO PROGRESS

The world's best brains are hard at work today developing new materials and processes. Created for present urgent needs, these are the elements of progress for years to come.

Action of this prelude to progress unfolds as rapidly as machines can be built to give form and substance to the products of American brainpower. Clearing Presses, built to do specific jobs, play no small roles. The ability to originate construction features which result in more precise presses of greatly increased productivity—plus unexcelled facilities for building presses of all types and sizes—have won for Clearing Machine Corporation preeminence in its field today.

When you who do the planning for industry's progress begin charting the course that progress is to take, put this talent to work for you. Consult with Clearing now on problems of "shapes of things to come."

CLEARING MACHINE CORPORATION
6499 W. 65th St., Chicago, Illinois

A 300 ton capacity Clearing Mechanical Press brings important accuracy and speed to cupping operations in the manufacture of 40 mm cartridge cases. It's one of a battery of presses used to speed up this phase of war production.

CMC CLEARING

FOR SHAPES OF THINGS TO COME

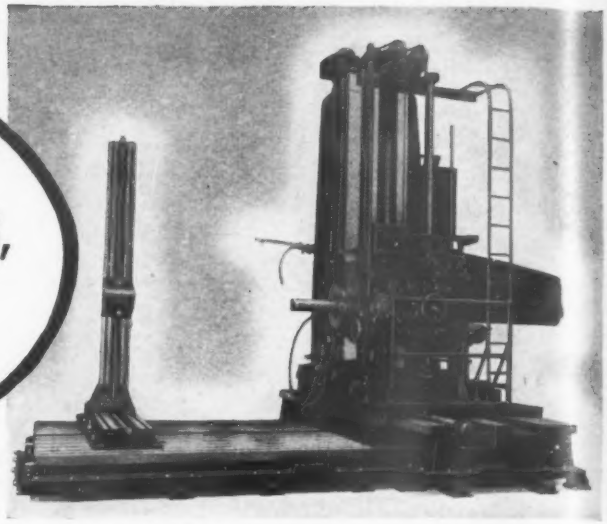
CLEARING

MECHANICAL AND HYDRAULIC PRESSES

OHIO

HORIZONTAL BORING, DRILLING, MILLING MACHINES *and* REVOLVING TABLES

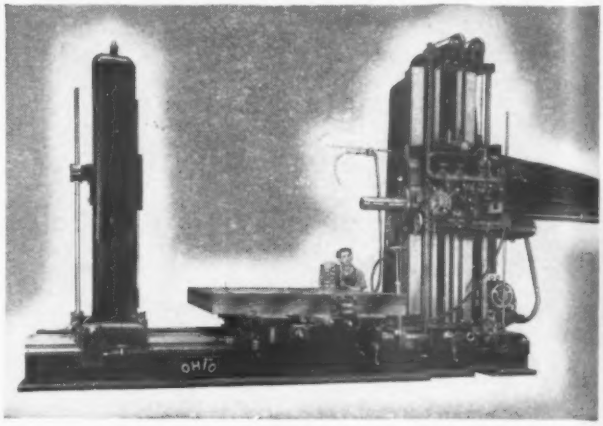
OHIO'S STEP UP PRODUCTION



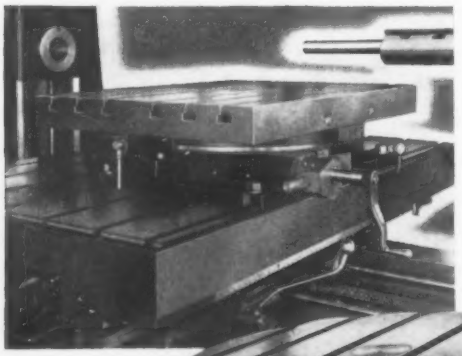
Ohio Horizontal Boring, Drilling and Milling Machines are furnished in 5" and 6" spindle sizes in both table and floor types. Extra heavy duty floor type is illustrated above.

Ohio Horizontals are built by a company which has served the metal-working industry since 1887 and which brought out the first all-anti-friction horizontal boring mill to appear in this country. Today, Ohio Horizontals are doing a notable job in production lines where high output must be combined with extreme accuracy. Ask for Bulletin 300 . . . Ohio Revolving Tables are high grade precision units graduated in half degrees. Round and square types are available from 24" through 96" in many combinations. Get our new well illustrated 12-page bulletin.

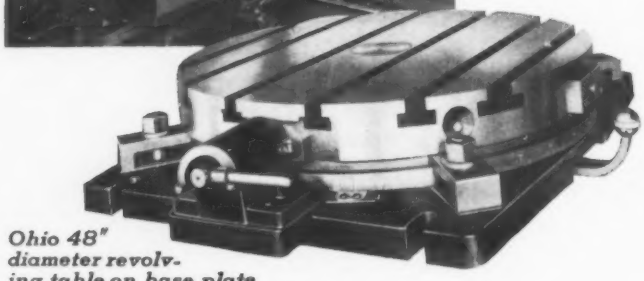
THE OHIO MACHINE TOOL COMPANY, KENTON, OHIO



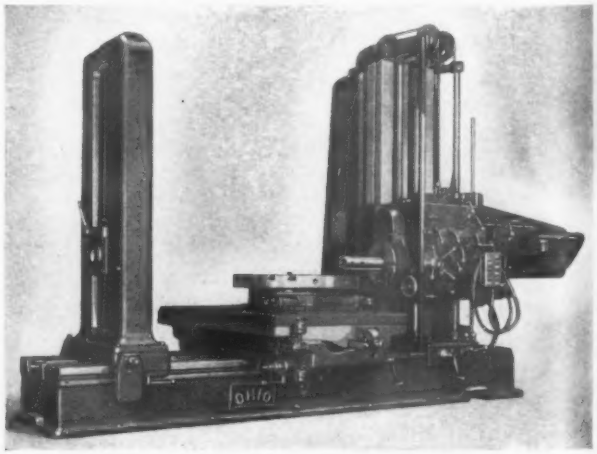
Ohio Dreadnaught extra heavy duty table type has portable control, making for quick, convenient operation. 72"x144" table. 60" wide bed.



• OHIO 48" square worm feed revolving table with anti-friction raising device and index pin and four stops.



Ohio 48" diameter revolving table on base plate with anti-friction raising device and index pin with four stops.



Extra heavy duty table type with 48"x84" table, 43" wide bed and threading attachment.

OHIO DREADNAUGHT

HORIZONTAL BORING, DRILLING AND MILLING MACHINES • SHAPERS • PLANERS

No. 9 in a Series of Tips on "Keeping 'em Turning"
by Arch Metzgar, 43 years at LeBlond.

I'm Tellin' You...

Eight of my sidekicks here at LeBlond have already given you lathe operators some tips on taking care of your machines. But I'd like to hand out some reminders on how to take care of *yourself*. A lathe really isn't a dangerous machine unless the operator gets careless or forgets one of these common sense rules. A good way to be sure you'll be on the job every day is to remember all of them.

STOP

STOP YOUR MACHINE BEFORE YOU -

1. Caliper your work
2. Clean chips from work or tool
3. Oil or wipe machine

FASHION NOTE - No. 1

Save your eyes. They're the only pair you have. Wear goggles when your operation makes the chips fly.

FASHION NOTE - No. 2

Jewelry is excess baggage. Don't wear rings, wrist watch, or pocket chain. You might get in the whirl of things before you know it.

HOLD TIGHT

Mount work securely, clamp as close to tool post as possible. Be sure tool is in correct position.

WATCH YOUR STEP

See that the floor around your lathe is always clean. Keep oil wiped up. It's slippery. Don't let chips and shavings pile up. Don't let your mind wander.

FASHION NOTE - No. 3

Don't feature a collegiate drape shape in your work clothes. Wear tight fitting clothes with no tie, or tie tucked in. Roll up your sleeves.

ARMY E NAVY

THE R. K. LeBLOND MACHINE TOOL CO.

CINCINNATI, OHIO

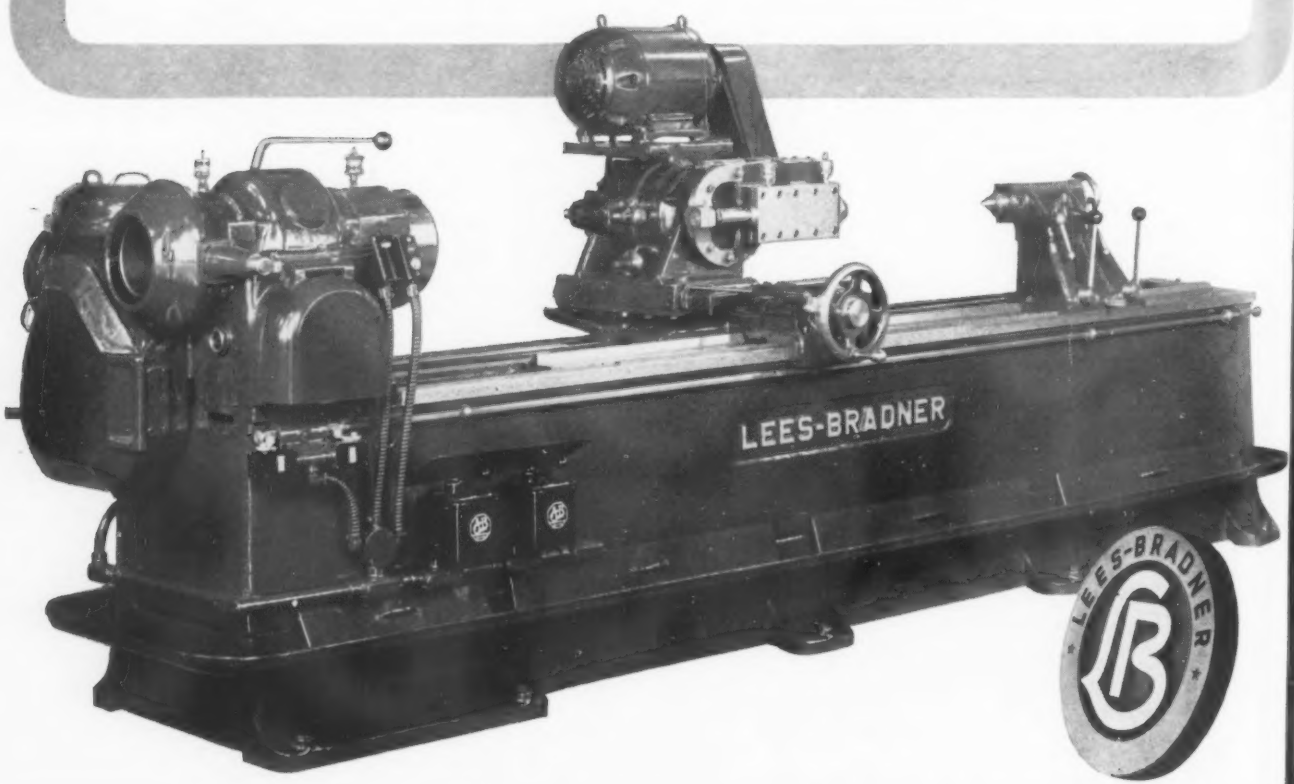
For *LONG* Threads
For *SHORT* Threads
For *RIGHT HAND* or *LEFT HAND* Threads
Wherever the Requirements are for Precision and High Production...

Use an
L-B HEAVY DUTY THREAD MILLING MACHINE

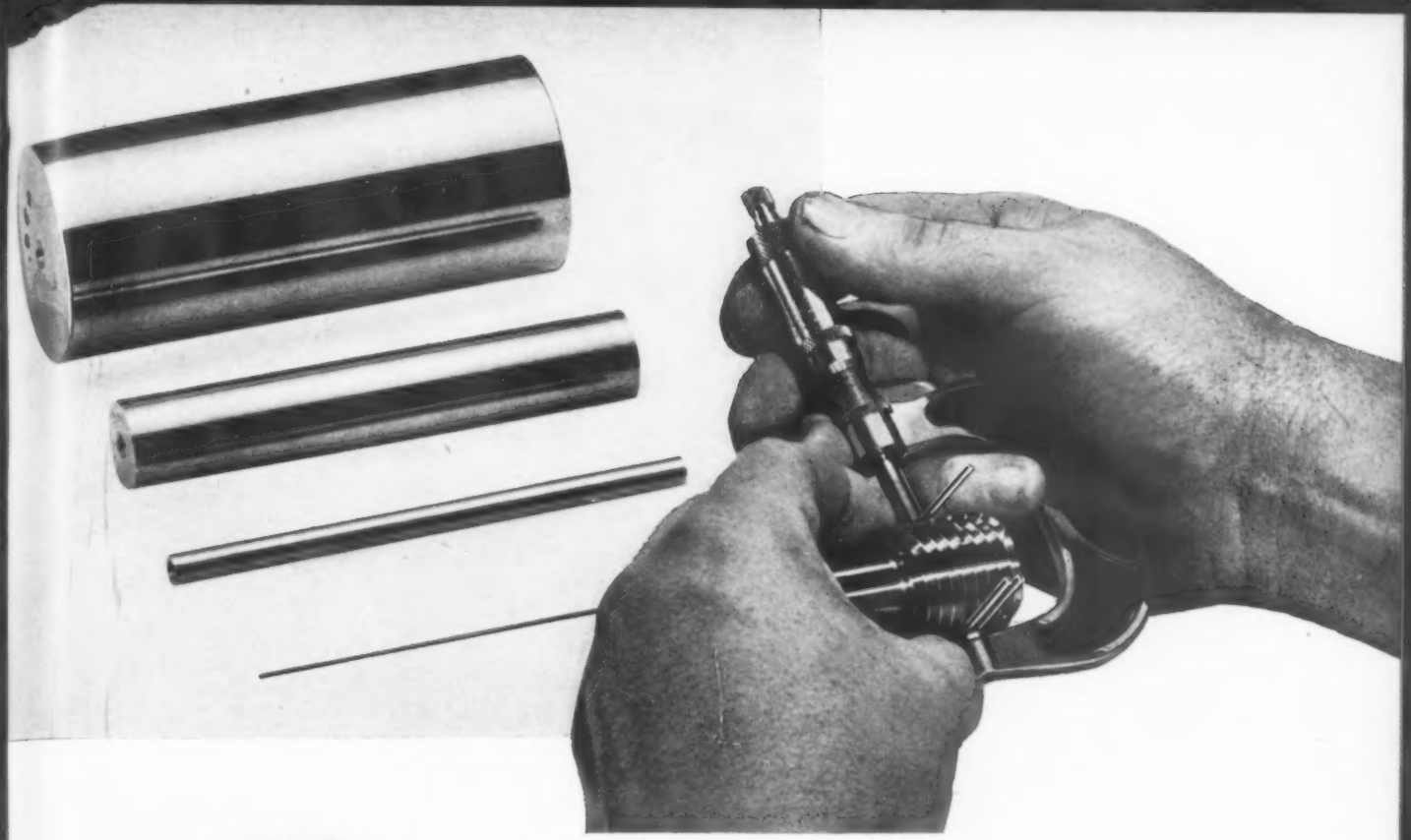
● Now being used in many machine tool plants to thread cross feed and lead screws of various lengths, it is also being used with equal success to generate internal threads of the utmost precision on landing gear parts.

Also in the majority of cases this sturdy machine not only maintains rigid tolerances but shows surprising increases in production.

Consult an L. B. Engineer on your precision threading requirements.



The LEES-BRADNER Company
CLEVELAND, OHIO, U.S.A.



THREAD MEASURING WIRES
A *Standard* FOR ACCURACY IN LEADING WAR PRODUCTION PLANTS

The wire system of thread and gear measurement is easy to use and gives exceptionally accurate results. Our Manual of precision measuring tools gives complete tables and simplified formulas for measuring all standard threads, splines and spur gears. Send for this valuable handbook!

Leading arsenals and war production plants know the importance of accuracy in thread and gear measuring. That is why so many of these plants are using Van Keuren Measuring Wires as standard equipment for measuring thread gages, taps, worms, splines and spur gears. Made in any size from 1.5708" down to .002" in diameter, they are guaranteed to be within .00002" for roundness and straightness and within plus or minus .000025" for size. Special sizes can be made to your specifications as to size and tolerances. Easy to use, VK Wires bring ultimate accuracy to your operations. Write for full details.

THE VAN KEUREN CO.

176 Waltham St., Watertown, Mass.

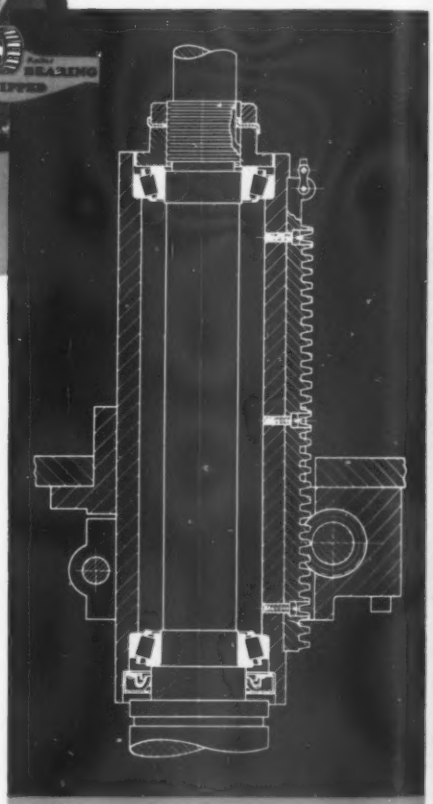
THE VK SYSTEM . . . Light Wave Equipment
Light Wave Micrometers — Reference Gage Blocks
Microgages — Taper Insert Plug Gages — Wire Type Plug Gages — Measuring Wires — Thread Measuring Systems — Gear Measuring Systems — Shop Triangles

23RD YEAR

Bakewell No. 2 Precision Tapping and Threading Machine equipped with Timken Bearings on the spindle. Self-contained motor drive. Forward speeds, 900 and 1800 R.P.M. Reversing speed 1800 R.P.M. Operating speed range 9.7 to 1442.2 R.P.M.

Keep your machines driving harder for Victory; equip them with more Timken Bearings. Redesign now. Then post-victory problems, too, will be simplified.

Application of Timken Bearings on the spindle of the Bakewell No. 2 Tapping Machine.



The performance of machine tools of all kinds is improved by the application of Timken Tapered Roller Bearings—the more bearings the better the performance.

A few Timken Bearings are better than none in any machine—be it a lathe, milling machine, drilling machine, boring machine, grinder or any other piece of equipment; but when you have them at *every* point of friction and hard service you are assured of top-notch production in both *quality* and *quantity*—through higher speeds, increased precision, greater endurance.

Manufacturers whose engineers use Timken Bearings at every suitable position in the machines they design are fortunate, for besides getting *better* machines, they get *better selling* machines, because the trade-mark "TIMKEN" is a mark of superiority wherever equipment is purchased. The Timken Roller Bearing Company, Canton, Ohio.

"All There Is **TIMKEN** *In Bearings"*

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

The One Test For Every Decision — *Will It Help To Win The War?*

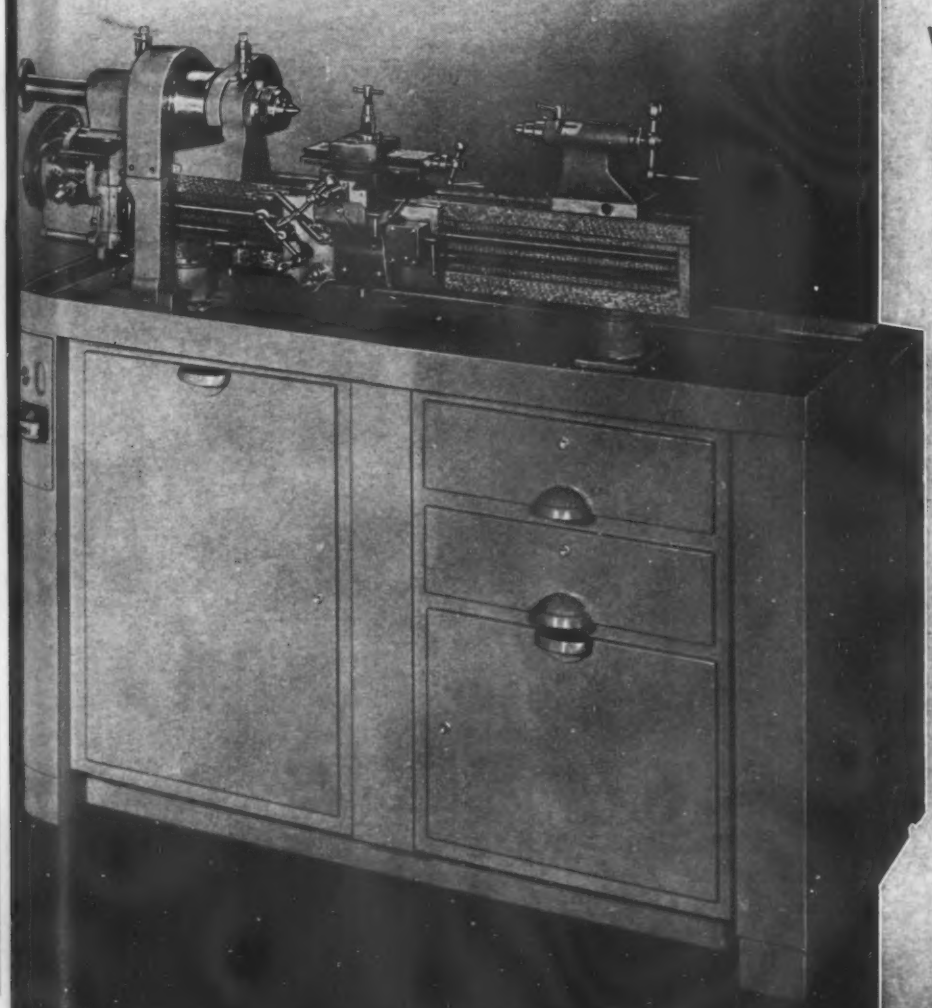
RIVETT

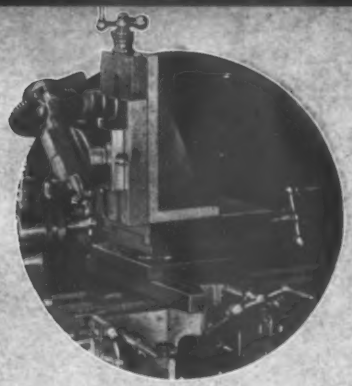
608 WITH VEE BELT DRIVE

In Tool-Making and Instrument Shops It Will Handle Great Variety of Jobs in Minimum Time

The Rivett No. 608 is a super-precision, back-geared screw-cutting bench lathe designed for fine manufacturing, repair and experimental work. In tool-making and instrument shops it will handle a great variety of parts within the closest precision limits.

Finely made attachments for milling, spiral cutting, slotting, relieving, taper turning, ball turning, grinding, forming and multiple operations enable the user of a fully equipped No. 608 to finish his work completely without recourse to other machines, and throughout his entire series of operations to utilize the inherent precision of the lathe itself.





Milling

Multiple Operations

SPECIFICATIONS

With Flat or Vee Belt Drive

Swing over bed, dia.	8½"
Length of bed	40"
Distance between centers	18¼"
Collet capacity, max. dia.	1"
Step chuck capacity, max. dia.	6"
Jaw chuck capacity, max. dia.	6"
Spindle capacity, max. dia.	1⅛"
Slide rest, travel of top slide	5¼"
Slide rest, travel of cross slide	4½"
Feed range, through gear box	.0015" to .0220"
Thread range, through gear box	10 to 144
Tailstock spindle travel	3¼"
Spindle speeds:	
Flat belt drive—12 speeds	39 to 1295 r.p.m.
Vee belt drive—12 speeds	25 to 1500 r.p.m.
Weight of lathe, mounting and drive:	
Flat belt drive, net	900 lbs.
Vee belt drive, net	1050 lbs.

For Further Description Write for Bulletin 608

RIVETT LATHE & GRINDER INC.

Twist Drills—Milling Cutters —Reamers—Hobs—Slittings Saws—End Mills—Taps—Dies —Screw Plates—Profile Cutters—

EVERY SMALL TOOL JOB IS AN OPPORTUNITY FOR A SAVING

Completeness of the UNION line makes it possible to realize BIG SAVINGS on many operations. Milling, drilling, reaming, hobbing, slitting, tapping, threading, cutting can be speeded up and costs reduced by these modern, fast, accurate tools.

Cost minded production men know from experience that UNION tools can always be depended on for economy and increased cutting efficiency over long periods between grindings.

Because of the wide range of tools in the UNION line, with each tool designed for maximum results, standardization on UNION tools can mean an overall total saving of substantial proportions. Put UNION tools to work and see for yourself.

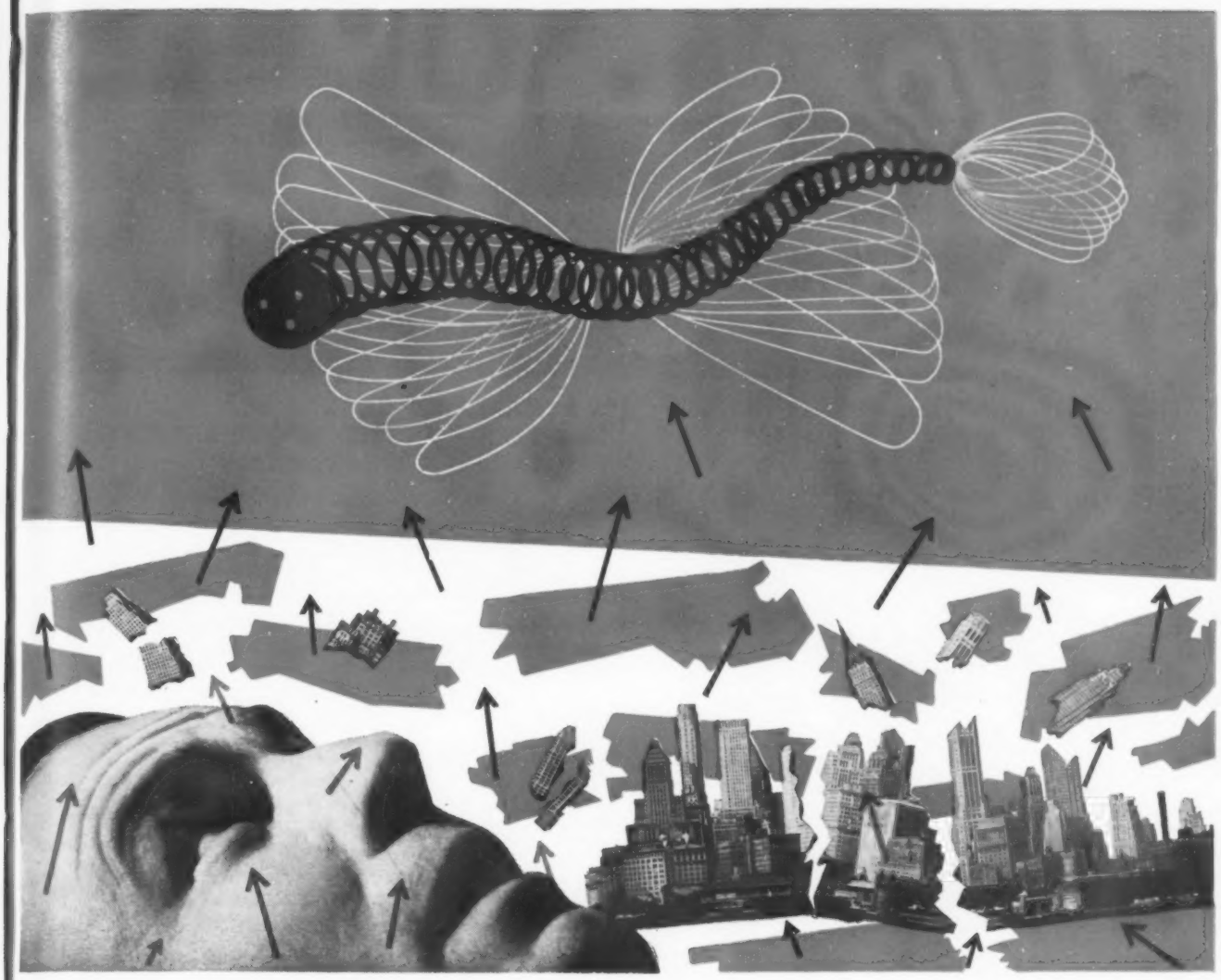
UNION
TWIST DRILL COMPANY
Athol, Mass.

STORES New York Store: 61 Reade St.; Los Angeles Store: 524 East Fourth St.; Chicago Store: 11 So. Clinton St.; Seattle Store: 568 First Ave., So.; San Francisco Store: 121 Second St.; Detroit Store: 6540 Antoine St.

MANUFACTURING DIVISIONS
S. W. Card Mfg. Co., Div.; Mansfield, Mass. Butterfield Division, Derby Line, Vt., and Rock Island, Quebec

Representatives throughout the world

UNION



If worms had wings . . .

IF WORMS HAD WINGS, chances are our entire economy would collapse! All because their specialty—that of swallowing earth—is unique and indispensable!

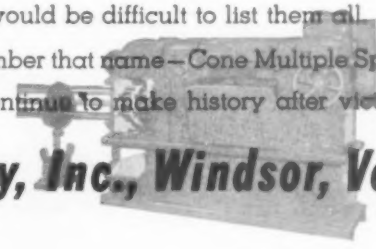
The earthworms in a single acre of ground carry more than 18 tons of earthy castings to the surface in a year! Thus, by constant plowing, they make it possible for air, moisture and life-giving minerals to circulate... and so for all plant-life to flourish!

But if worms had wings, they'd never be satisfied with so plebeian an occupation as burrowing. They'd just fly around. And in the meantime, the whole world would go to pot.

The moral is plain: Specialization is of so great importance that our modern world could not survive without it. Our democracy could not fight without it. Take machine tool production. We have overcome Germany's 7-year head start in about a year, and are even now outproducing the Reich in machine tools in the ratio of 5 to 1.

A potent factor in this production miracle has been the multiple spindle automatic lathe made by Cone. These titans of the machine tool industry are currently used in the production of so many different munition parts it would be difficult to list them all.

Remember that name—Cone Multiple Spindle Lathe. It will continue to make history after victory is won!



CONE Automatic Machine Company, Inc., Windsor, Vermont

Magni-Ray

"A REMARKABLE CHANGE HAS BEEN EFFECTED IN OUR SHOP BY NEW MAGNI-RAY"

says Mr. Christian Dahlerup, Supt.
of the Atlantic Gear Works.

"Before the great rush in our business we would have never believed that a simple instrument like the **MAGNI-RAY** could be of such great importance in our work.

"We were used to seeing our men, particularly Toolmakers and Machinists groping around with magnifying glasses or with watchmakers' loupes clamped on their eyes, trying to read verniers, mikes, dials, inspecting work, examining cutting edges of tools, grinding and gear cutter marks, burrs, etc.

"A great waste of time which we thought unavoidable was continually going on. Now we have your **'MAGNI-RAY'** in various convenient positions in the shop and it is a pleasure to see the men making use of them, which has helped to accustom them to do better work, more neatness in precision work and saving in time. The **MAGNI-RAY** will show anything up clearly in even the darkest parts of our shop.

"We would not like to go back to the old way, and we are glad to recommend this instrument to every shop doing precision work."

NEW MAGNI-RAY has been developed to meet the needs of thousands who require a wide-field illuminated magnifier. **MAGNI-RAY** offers scientifically correct lighting directly on the object in the magnification field. Outside reflections are completely shut off and the bulbs are shielded in such a manner that no light rays are thrown back into the eyes of the user.

Model A. Consisting of **MAGNI-RAY** unit with 3 inch optical glass lens, complete with two bulbs, electrical equipment, swiveling clamp and stand. **Price $18.50.**

Model B. Consisting of **MAGNI-RAY** unit with achromatic lens magnification field of 2 inches and magnification power of 3 plus, complete with two bulbs, electrical equipment for plugging into 110 volt circuit, swiveling clamp and stand.

Price $27.50

MAGNI-RAY gives clear, undistorted magnification combined with strong, evenly concentrated illumination.

MAGNI-RAY increases efficiency because it reduces fatigue common in inspection work.

MAGNI-RAY quickly detects

★Burrs and poor finish on small parts, screws, pins.

★Cracks in steel after hardening.

★Imperfect welding seams.

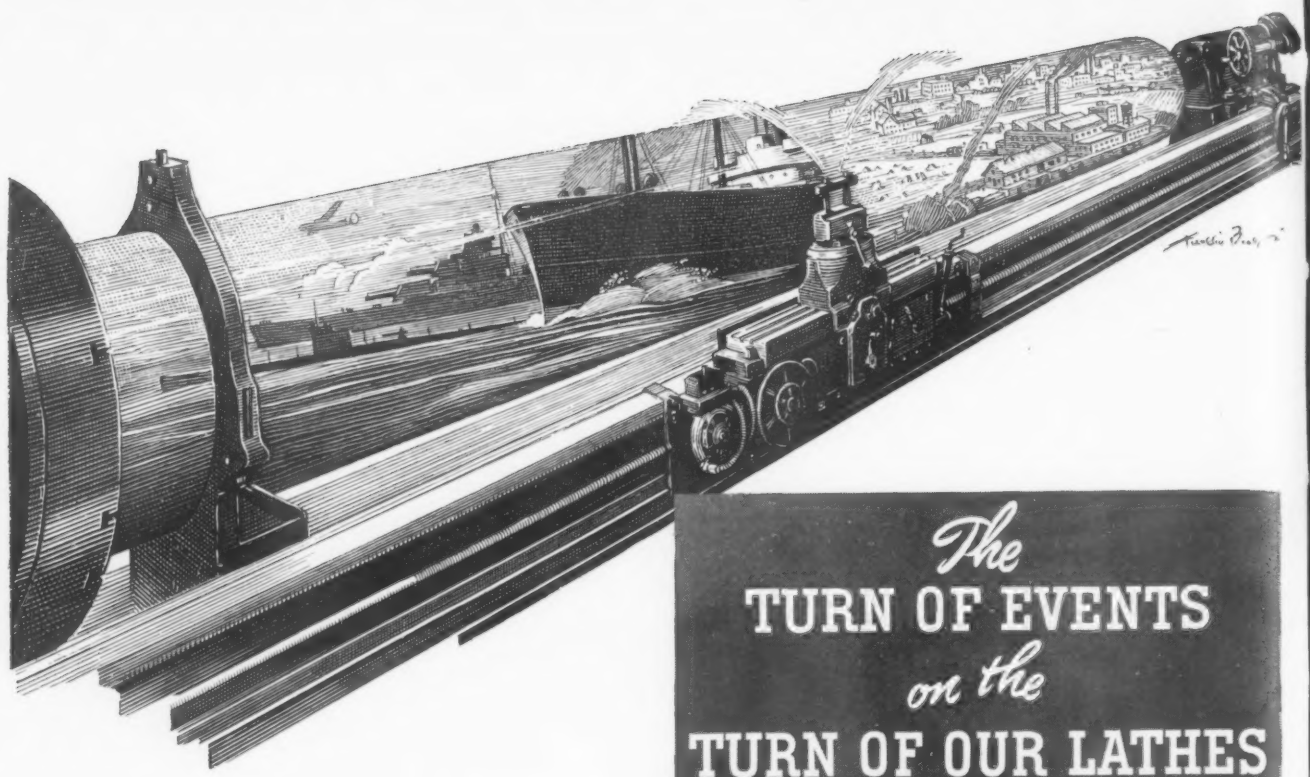
★Blow holes in castings for machine tool beds, tools, dies, etc.

MAGNI-RAY can be used wherever magnification is called upon to aid the human eye.

GEORGE SCHERR CO., INC.

124 LAFAYETTE STREET • NEW YORK, N. Y.

WOW!
WHAT A WALLOP
For 55 years, Kempsmith Milling Machines have proven their ability to "take it on the chin" and come back for more punishment. Today, Kempsmith power, ruggedness and speed are helping the United Nations win the grim battle of production.
KEMPSMITH MACHINE CO.
MILWAUKEE, WIS., U. S. A.
KEMPSMITH
KEMPSMITH
Precision Built · Milling · Machines Since 1888



The TURN OF EVENTS on the TURN OF OUR LATHES

Every hour, every day, every night—for as long as need be—we American workers will make what is needed for our war, so that we shall win our peace. We shall not slacken or stop, now or then. We shall accept the challenge of the Peace with the same courage and skill and fusion of interests that will enable us to break every production record in the world. And as the blessings of peace come to sanctify the sacrifices of war, we shall live in the comfort of a job well done . . . for the turn of events is encompassed by the turn of the lathes.

GENERAL MACHINERY CORPORATION

HAMILTON, OHIO

THE NILES TOOL WORKS CO.

THE HOOVEN, OWENS, RENTSCHLER CO.

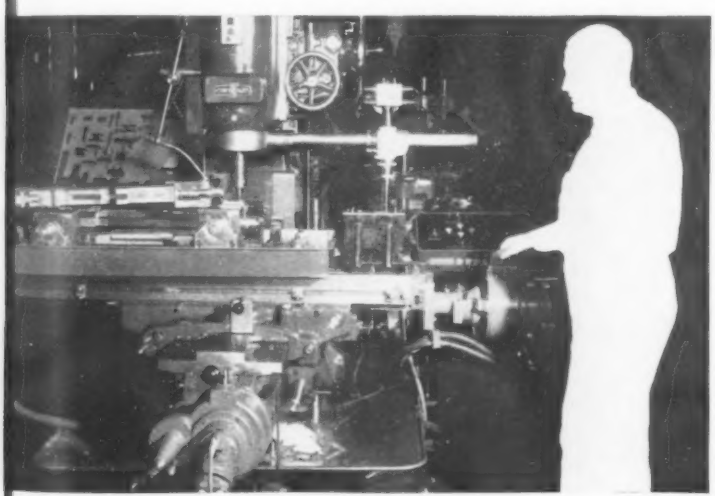
GENERAL MACHINERY ORDNANCE CORPORATION

● MAKERS OF STEAM AND DIESEL ENGINES, CANNON, HEAVY INDUSTRIAL MACHINERY —AND THE MACHINES THAT MAKE THEM.

"LET ME DO THAT *Contour Machining*"

If I can lift that work I can machine it!"

With a DUPLIMATIC on the job, the accuracies you've got to have at the speeds you demanded are now a fact. You shove a DUPLIMATIC up to any machine tool, connect it up and within a few hours the old operator, or a "greenhorn," is doing more work, more accurately even, than was ever possible by manual control alone.



This mill is equipped with a DUPLIMATIC. During the actual cutting, the operation is *full automatic.* She CAN operate this milling machine just as she can quickly learn to handle any standard tool room machine if it has a DUPLIMATIC.

Can she lift the work? That's the only question before she "takes over" from the recently drafted, skilled operator you thought you couldn't get along without.

DUPLIMATIC automatically turns one, two or three feed screws, on almost any standard machine tool in your plant. Turns them simultaneously, yet independently of each other. The result is blended radii . . . less hand-finishing . . . fewer scrapped parts.

Faster, More Accurate Contour Machining

Prompt deliveries of DUPLIMATICS eliminate long waiting for specially built automatic machines. Added floor space is not required.

Ask for complete information. Find out how the biggest mass producers of war goods like Pullman-Standard, Pressed Steel Car, Pontiac, Chevrolet, Buick, Cadillac and all the other important producers are using DUPLIMATICS to produce more TANKS TORPEDOES • BOMBS • GUN PARTS • AIRPLANE ENGINE PARTS • TANK TURRETS ANTI-AIRCRAFT GUN PARTS • AIRPLANE LANDING WHEELS . . .

When your pet machinist gets drafted . . . draft *DUPLIMATIC.*

DUPLIMATIC
and your present tool room tools will do more contour machining faster, more accurately and with less skilled help.

DETROIT UNIVERSAL DUPLICATOR CO.

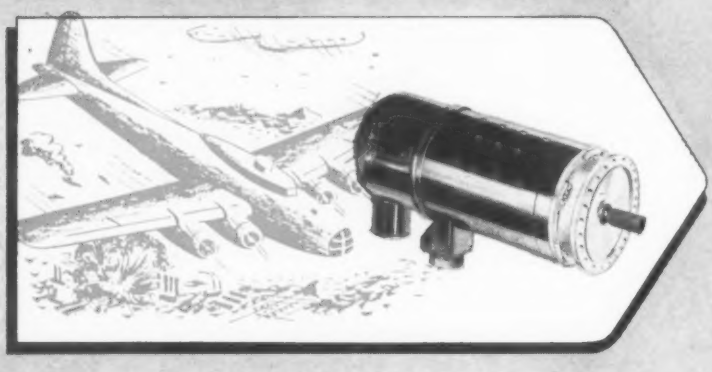
737 E. Milwaukee Ave. Detroit, Michigan

Do You Need

MOTORS FOR NAVAL APPLICATION

In a space of *five weeks*, production of a brand new series of motors was raised 400 motors per week. Scheduled delivery to eight different customers was smoothly established.

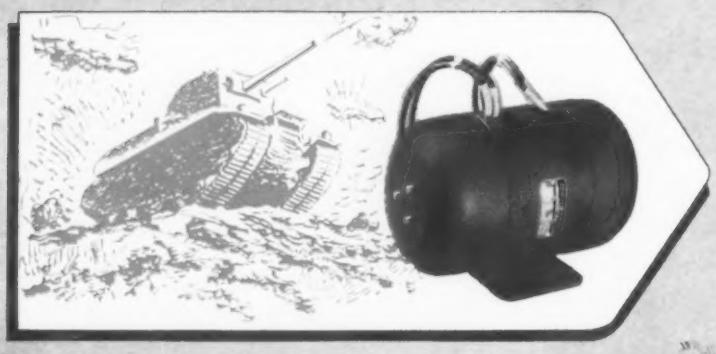
★



A SMALLER, LIGHTER GENERATOR FOR AIRCRAFT

A generator *one-sixth the weight* of comparable industrial types was developed, meeting stringent specifications for high-altitude performance—a typical example of ingenious G-E design.

★



A SPECIAL DYNAMOTOR FOR USE ON TANKS

To power radio equipment in tanks, a special dynamotor with increased capacity was developed. Sample in eight weeks; production in large quantities eight weeks after approval.

Builder of TRI-CLAD Motors ★ AMPLIDYNES AIRCRAFT POWER PACKAGES DYNAMOTORS GENERATORS EVERYTHING IN MOTORS

FIGHTING MOTORS*?

WE MAY BE ABLE TO HELP YOU

WE invite builders of motor-operated combat equipment to get in touch with us in the earliest stages of planning for their motor requirements. We are building so many new and ingenious fighting motors, it's 10 to 1 that we already have something which can be adapted to meet your needs.

Although we cannot accept any new orders for certain types of fighting motors, we do have, or will have in the very near future, facilities to engineer and build additional fighting motors of other types. We would appreciate the opportunity of reviewing your needs during the earliest stages of your planning, in order to determine how we can help you.

We have the pledge of the more than 1700 design and application engineers in our motor plants to give the fastest service it is humanly possible to give whenever they are asked to help on fighting motors. And even if we must say "No," we believe you will appreciate a fast answer. Get in touch with your local G-E representative to see if the fighting-motor design you need can be adapted to our available production facilities. *General Electric Co., Schenectady, N. Y.*

*"FIGHTING MOTORS" is our term for electric motors in equipment used by our fighting forces — motors which contribute to combat efficiency. In contrast to motors used for production, they may be designed, and produced by the thousands, and declared obsolete — all within a few months.

Fighting motors often require amazing ingenuity in their design, always demand the utmost in reliability, and must be produced with a new concept of speed. They are truly *life or death motors.*

GENERAL ELECTRIC

Horton chucks

INDEPENDENT Solid Reversible Jaws Only

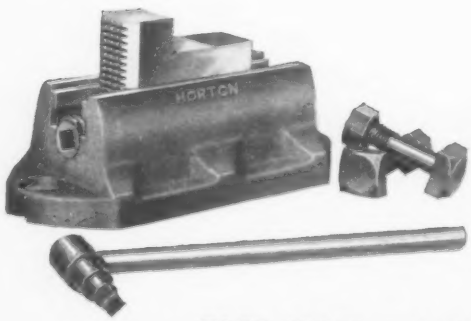
SCROLL UNIVERSAL Two-Piece Jaws Only

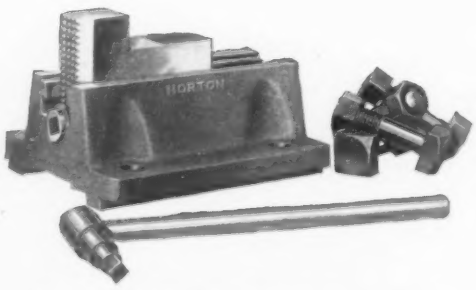
For Use With Intermediate Plates On Threaded Spindles

For Key Drive Tapered Nose Spindles

War Production Limited To These Essential Chucks

For Flanged Tapered Nose Spindles
Illustration shows chuck for Type D (Cam Lock) Spindle



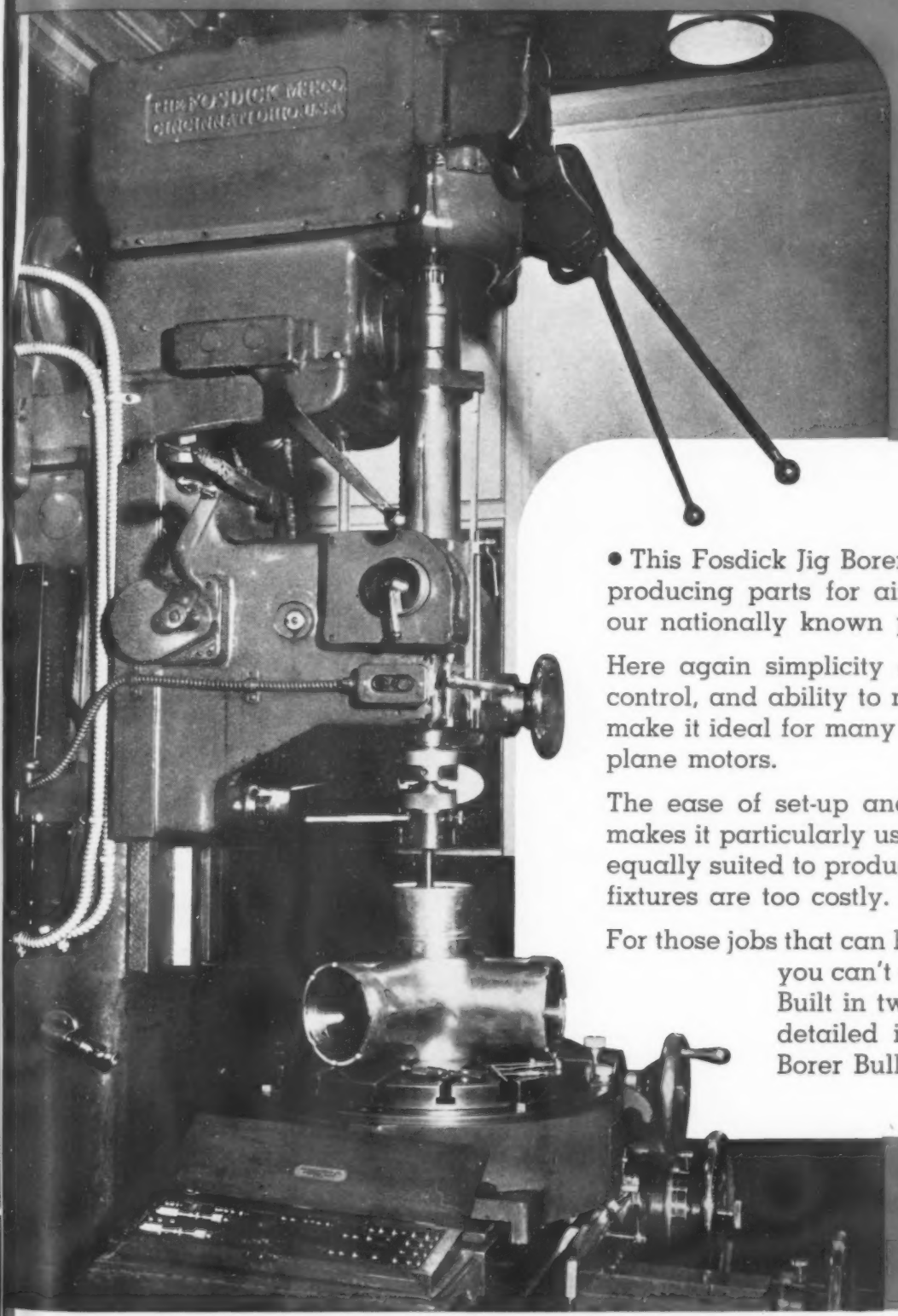


FACE PLATE and BORING MILL JAWS—Steel Body Only

HORTON
MORROW

SINCE 1851 .... THE E. HORTON & SON CO.
WINDSOR LOCKS, CONNECTICUT, U. S. A.

FOSDICK *Jig Borer*



HELPS PRODUCE MORE MOTORS FOR MORE PLANES

• This Fosdick Jig Borer is doing its part toward producing parts for airplane motors at one of our nationally known plants.

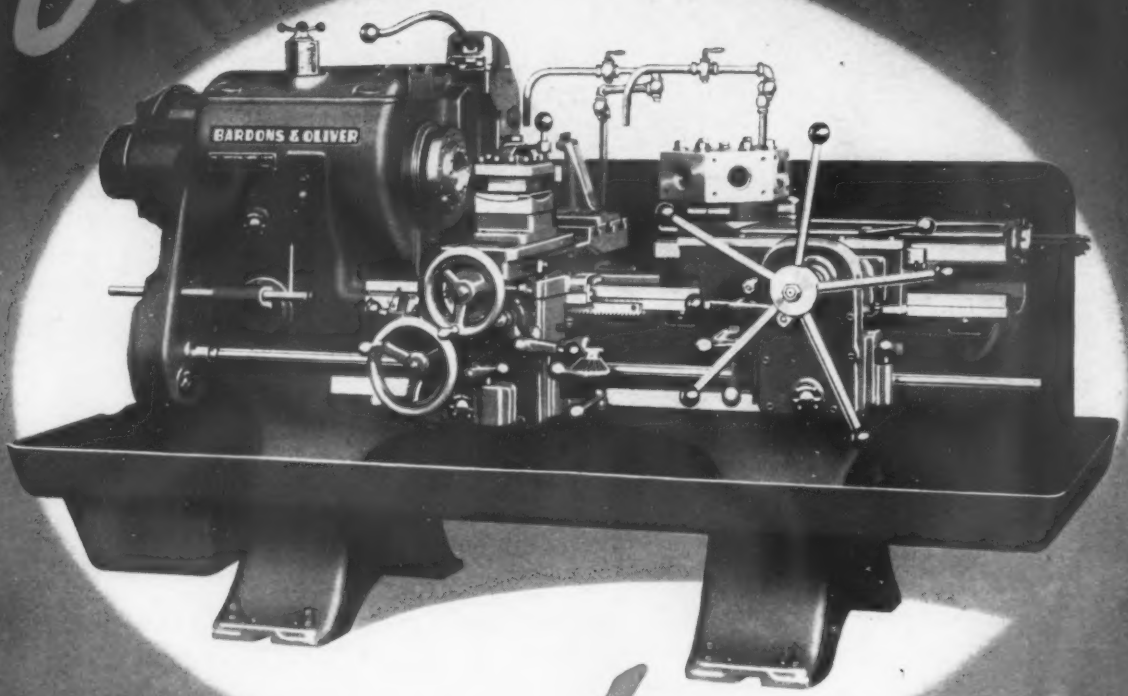
Here again simplicity of operation, centralized control, and ability to maintain close tolerances make it ideal for many of the operations on airplane motors.

The ease of set-up and flexibility of operation makes it particularly useful in the tool room and equally suited to production jobs where jigs and fixtures are too costly.

For those jobs that can be handled on a Jig Borer you can't go wrong with FOSDICK. Built in two sizes 30 and 30-A. For detailed information write for Jig Borer Bulletin J.B.A.

FOSDICK MACHINE TOOL COMPANY
CINCINNATI · · · OHIO

Bardons & Oliver



Leadership...

Bardons and Oliver

HAS BEEN ESTABLISHED

BY PERFORMANCE

BARDONS & OLIVER, INC.

1133 W. 9TH ST. . . CLEVELAND, OHIO

Keep 'em Cutting!

with a

SELLERS

Heavy Duty TOOL GRINDER

Sellers No. 5T and 6T Tool Grinder grinds any cemented carbide or high speed steel, straight or convex curved face tools, including thread tools of any angle of thread or pitch, internal or external, and will accurately reproduce the desired angles and clearances on all the tools. It handles all sizes of tools and tool bits from ¼" up to the maximum size of the chuck used, 2" x 2½" or 3" x 3" square.

This machine does all the work necessary to finish to shape from either forged or bar stock cutting tools for lathes, planers, boring mills, etc., making it possible to maintain, ready for use, a full supply of such tools. It effects savings in tools by removing the minimum amount of tool material, in production costs by producing the exact shapes required to maintain high cutting speeds, and in grinding time, by more rapid shaping and sharpening.

It is also applicable for grinding double end cutters for boring bars, fly cutters, inserted teeth for heavy saws, rock drill bits, round punches, chisels, oil grooving gouges, etc., by means of special chucks or holders.

Write for bulletin or special information

WILLIAM SELLERS & CO., Inc. • 1600 Hamilton St. • Philadelphia, Pa.

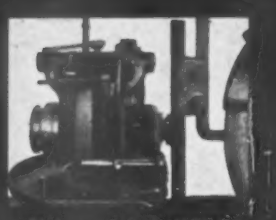
FOUNDED SELLERS 1848

Sellers

Grinding the left side face of a thread tool of great pitch.

Grinding the left side face of a large V-tool.

Grinding a circular tool.

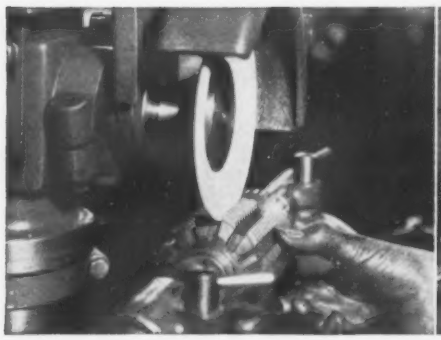


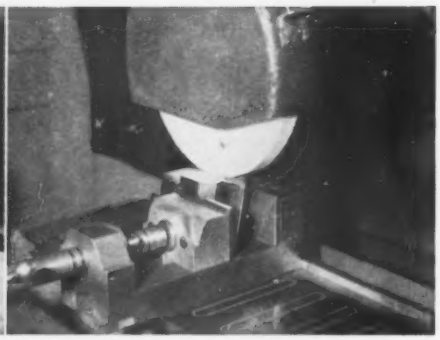
Supplemental chuck as used for the end face of a hook tool.

Setting a curved face tool

. . LOOK at the Large Pores!

And here are two jobs on which this Norton Open Structure Grinding Wheel can Boost Production





HOBS AND FORMED CUTTERS These often reach the tool room in such condition that considerable grinding must be done to restore them to service. This Norton #12 structure wheel is ideal for the work. It can be used in a grade hard enough to hold shape and still its large pores allow it to remove stock rapidly without burning.

SURFACE GRINDING On this type of work the Norton open structure wheel removes stock faster because the large pores allow deeper cuts without burning—especially on broad contact work. It is also good for jobs with interrupted contact because you can go to a harder wheel to get rid of the dressing action and still avoid burning.

This Norton No. 12 Structure wheel is a *real production booster* on jobs that require heavy stock removal with extra coolness of cut. But it is just one of several Norton structures available. Let Norton engineers study your grinding jobs and make sure that you are using the most suitable wheels —in abrasive and bond, in grain and grade as well as in structure.

'-908

NORTON COMPANY

WORCESTER • MASS.

New York · Chicago · Detroit
Philadelphia · Pittsburgh · Hartford
Cleveland · Hamilton, Ont.

Distributors in All Principal Cities

NORTON ABRASIVES

PHOTO BY
U. S. ARMY
SIGNAL CORPS

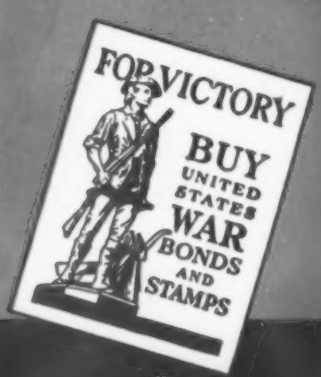
P&J AUTOMATIC CHUCKING EQUIPMENT

In quantity, quality and variety of parts produced, P&J machines are playing a vitally important part in war production. This fast, powerful equipment is meeting every demand made upon it for maintained accuracy, capacity and ease of handling. Production records, hitherto considered outstanding, are being broken again and again as the versatility of P&J tooling opens up ways and means to improve performance and reduce operation time.

Potter & Johnston's many years of experience in the production of duplicate parts is being applied to great advantage today in stepping up the production of vitally needed war equipment.

IS TOOLED FOR THE MAXIMUM PRODUCTIVITY OF PARTS . . .

For anti-aircraft guns, tanks . . . and other weapons of war.



The POTTER & JOHNSTON MACHINE COMPANY
Pawtucket, R. I.

Bottle the enemy quicker...
WITH MORE WAR BONDS

We're not interested in ZOOT SUITS

but we are interested in the phenomena of change...

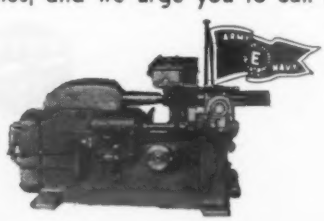
We're not rug cutters, and we're distinctly not "right with the rags." We don't wear a "solid suit of threads," padded at the shoulders like a lunatic's cell, with the "jut cuts" and the "reat pleats," the "cleave sleeves" and the "drape shape." That sartorial throwback of a juvenile ego is definitely not down our alley.

We're specialists in internal grinding problems, and Zoot suits (we fervently pray) won't wield their foolish influence upon the wheels of industry . . . but many a simple fad has!

When a boy and a girl once sat in a hammock, and he thrummed a mandolin and she softly sighed, "I just love your new soft collar" — the celluloid collar market quietly vanished from this earth . . . And the horse-and-buggy business employed a million men — until an explosive contraption, deplored as a dangerous fad, noisily disemployed them and put ten times their number to work.

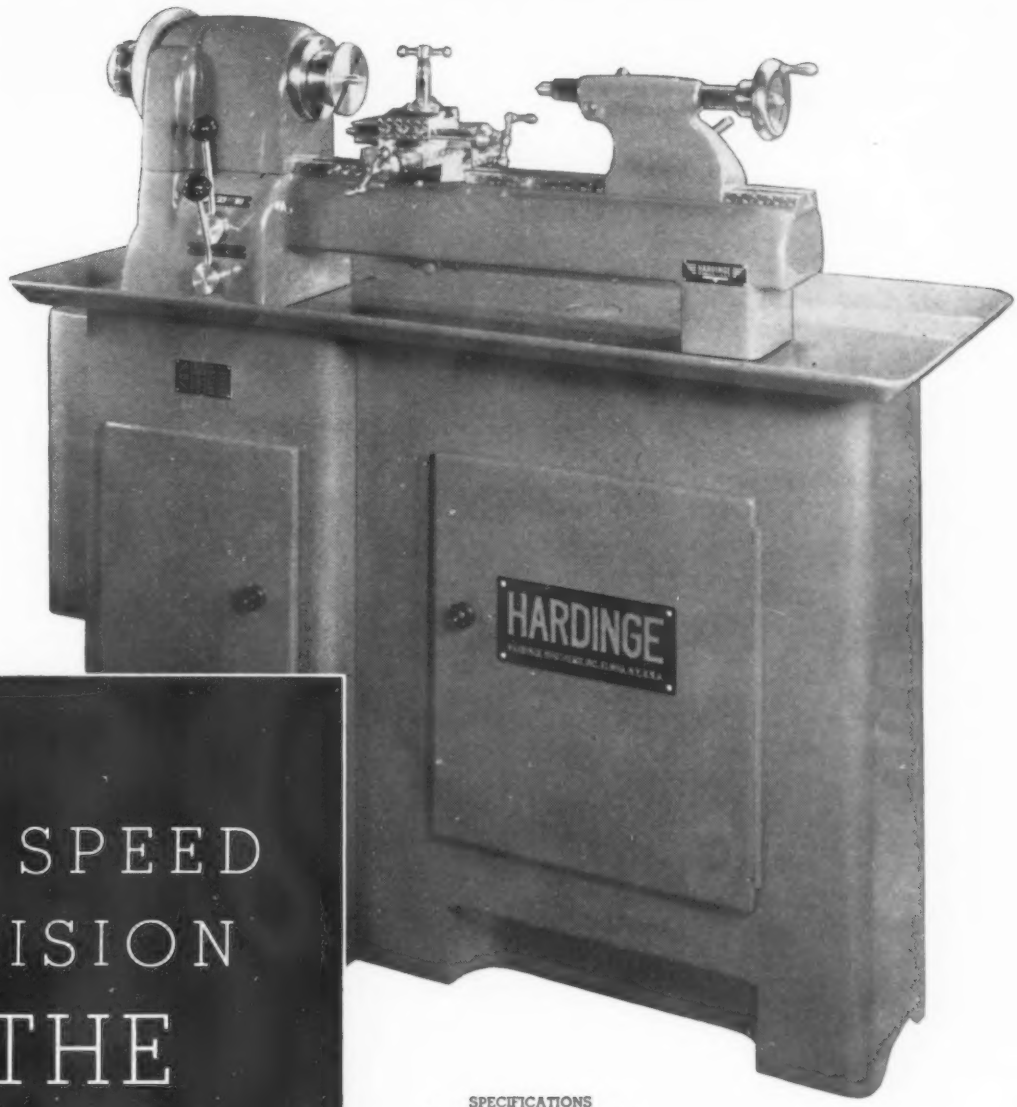
No, we're not interested in Zoot suits, but we are interested in the phenomena of change. And this is the fastest-changing period in all of industrial history. As a result, many businesses, seemingly on the rise, are actually on the brink of failure in the post-war world of better and cheaper materials.

We've developed many new techniques in grinding these materials, and we believe that this knowledge can be of greater value to manufacturers today than ever before. Bryant's Consulting Service is available to you at all times, and we urge you to call upon us now!



BRYANT CHUCKING GRINDER CO.
SPRINGFIELD, VERMONT, U. S. A.

HARDINGE



HIGH SPEED PRECISION LATHE

SPECIFICATIONS
1" collet capacity, 9" swing, 17" center distance, eight spindle speeds up to 4000 R.P.M.

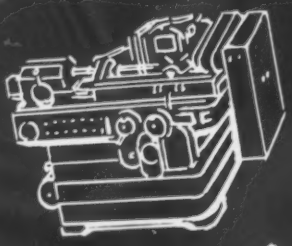
Designed to meet requirements of extreme lasting accuracy, high spindle speeds and the ease in operation required for the smaller diameter work range found in every tool room, laboratory and production department.

The simplicity of operation enables relatively unskilled operators to produce parts to the necessary close limits without expensive tooling. Your larger, expensive equipment will not meet all of the foregoing requirements necessary for practical results and proper economy.

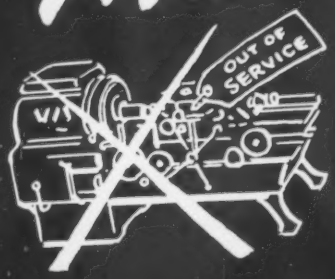
Because of the many advantages found through actual use, Hardinge Precision Lathes are being installed in ever-increasing numbers.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR

HARDINGE
ELMIRA, N.Y.

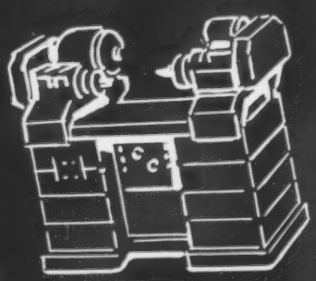


Machine tools can be "

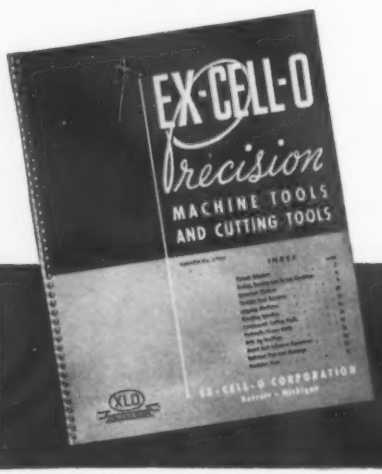


EX-CELL-O

Machine Tools are Built to Stay On the Job



Below: Ex-Cell-O's new catalog on precision machine tools, cutting tools, and other Ex-Cell-O precision products. Contains illustrations, descriptions, and specifications. A copy will be mailed free to any request on business letterhead. Ask for Ex-Cell-O Catalog No. 27121.



DURING all the hours of day and night, American machine tools must keep going if the vast volume of war work is to be produced without delay. There are no absentees among Ex-Cell-O precision machine tools. Wherever they are used in American industry, they are always on the job, available for all three shifts, every day of the week. Their ease of operation . . . combined with basically sound engineering design and substantial, rigid construction for which all Ex-Cell-O machine tools are noted . . . assures constant and maximum production

EX-CELL-O CORPORATION • DETROI

PRECISION THREAD GRINDING, BORING AND LAPPIN MACH
GRINDING SPINDLES • BROACHES • CONTINENTAL CUTTIN OOLS
EQUIPMENT • PURE-PAK CONTAINER MACHINE AILR

"absentees" too!

XLO

EX-CELL-O *means* PRECISION

T PAYS TO STANDARDIZE ON EX-CELL-O PRECISION THREAD GRINDERS (Style 35 Universal illustrated above):

ESIGN . . . Ex-Cell-O engineers, who introduced precision thread grinding to U. S. industry, are familiar ith today's threaded work needs. Ex-Cell-O thread grinders are designed to meet these needs specifically.

ONSTRUCTION . . . Ex-Cell-O thread grinders are substantially, compactly built—to give many years of rvice—with base, work table, controls, compartments, etc., all integral parts of a uniform exterior design.

DAPTABILITY . . . Within the designed capacity of each one of nine Ex-Cell-O standard thread grinding achines—automatics, universals, and plain production—a very wide range of threaded work is possible.

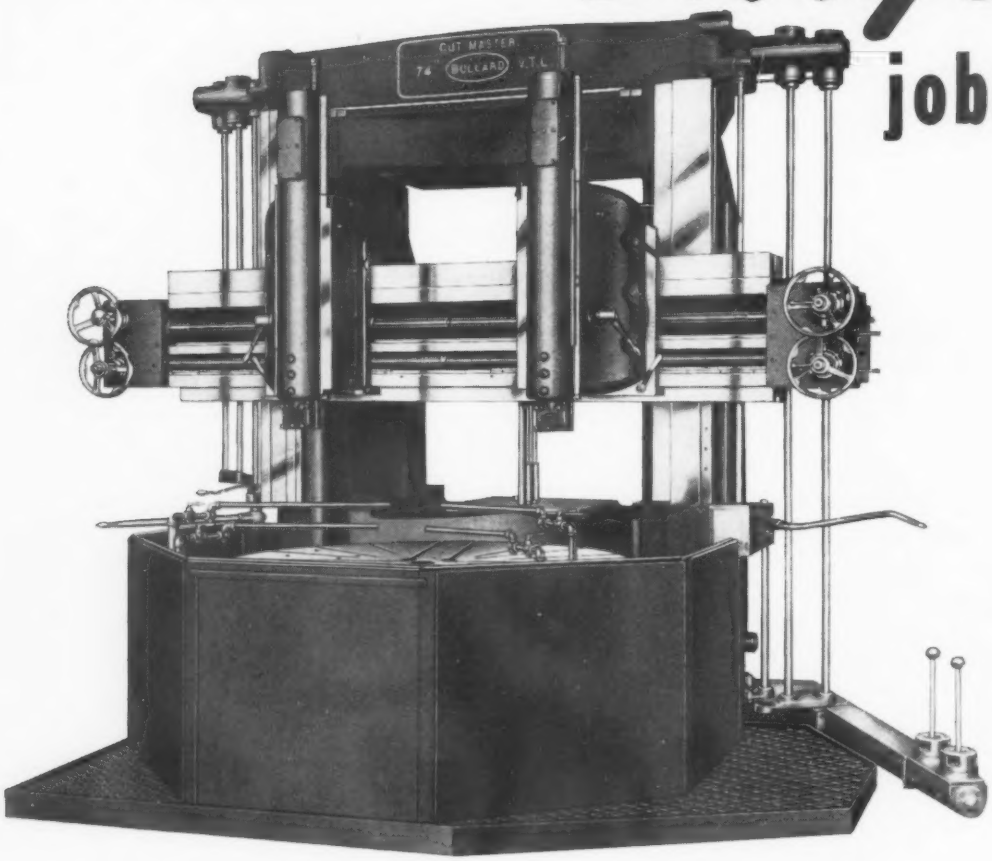
IDE VARIETY OF STYLES . . . Ex-Cell-O has developed precision thread grinding to cover the many quirements of American industry for precision threaded work, for the grinding of internal as well as external reads. There are available nine different styles of Ex-Cell-O precision thread grinders—all *standard* machines with the greatest practical interchangeability in the use of dressers and lead screw and nut assemblies.

ADE BY DEPENDABLE FIRM . . . Only one standard is acceptable at Ex-Cell-O—the greatest commercial curacy it is possible to attain, whether it be in the designing of precision thread grinders or any of the rious other precision machines and tools bearing the Ex-Cell-O name. It pays to standardize on Ex-Cell-O.

Below: Ex-Cell-O book on Thread Systems, Forms, and Measurements that contains much practical information for all those using Precision Thread Grinding Machines. A request for a free copy of this book, on your business letterhead, will be given immediate attention.

IN ACHINES • TOOL GRINDERS • HYDRAULIC POWER UNITS
TIN OOLS • DRILL JIG BUSHINGS • DIESEL FUEL INJECTION
NE AILROAD PINS AND BUSHINGS • PRECISION PARTS

Now—speed your *Larger* jobs, too

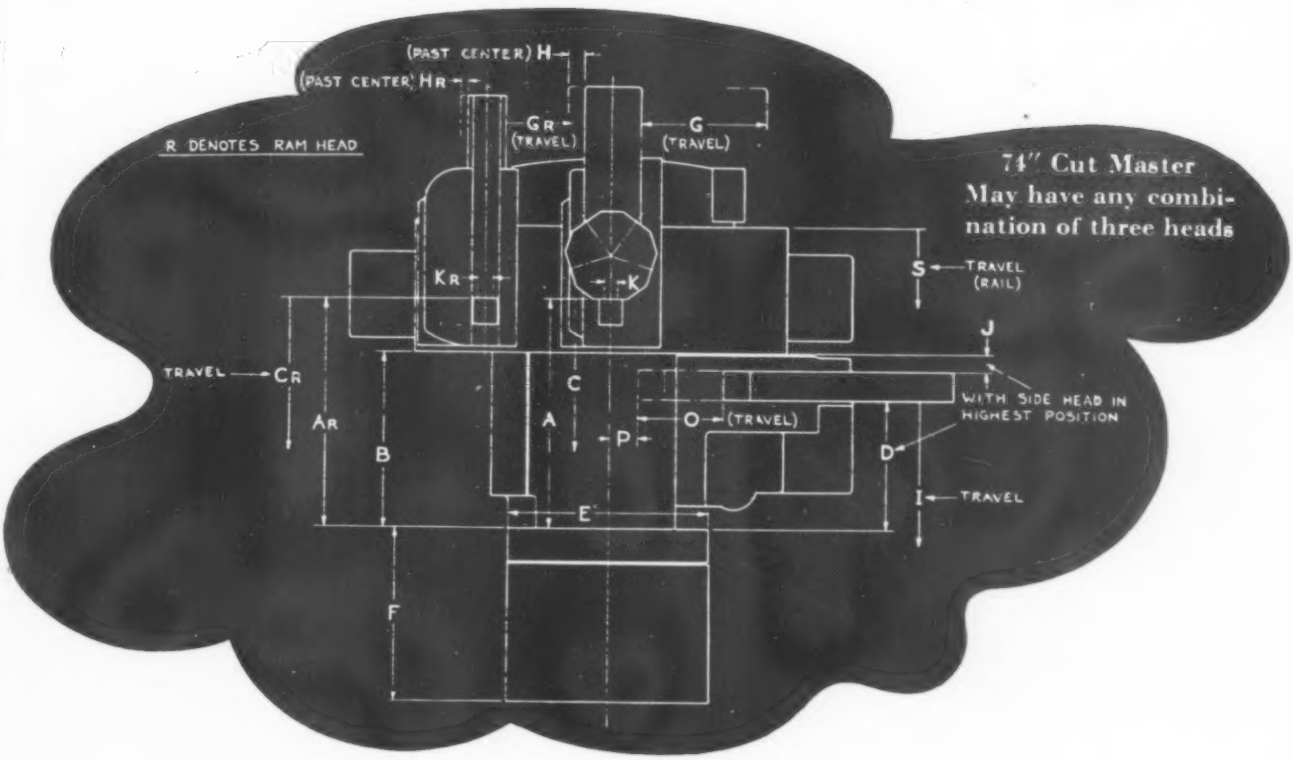


A new larger size production unit by Bullard means extra refinements . . . preloaded Timken Bearings on the spindle . . . simple and accurate control . . . automatic lubrication throughout . . . a range of table speeds to suit any requirement from the machining of heavy steel forgings to the accurate finish cuts on light metal.

Pick the heads to suit your work from the variety offered and specify your requirements quickly for early scheduling.

THE BULLARD

...with the BULLARD 74" *Cut Master*



SAFE CAPACITIES

These specifications apply only when two heads, either Ram and Ram or Turret and Ram, are used on the main rail.

MACHINE	A	B	C	D	E	F	G	H	I	J	K	O	P	S
Turret Head	73¼	62	30⅜	52⅝	74	36	46⅞	3½	62	3⅜	2¾	27	17½	50
R. H. Ram Head	73¼		30½				42⅞	7½			3⅜			
L. H. Ram Head	73¼		30½				46⅞	1½			3⅜			

Maximum Swing — Side Head in Working Position . 78 inches
Maximum Swing — Side Head Below Table Top . . 82 inches
Smallest Hole Tool Post Bores . . . . . 7¾ inches
Center Line — Table to Face of Cross Rail . . . . 14 inches
Center Line — Table to Face of Bed . . . . . 22 inches

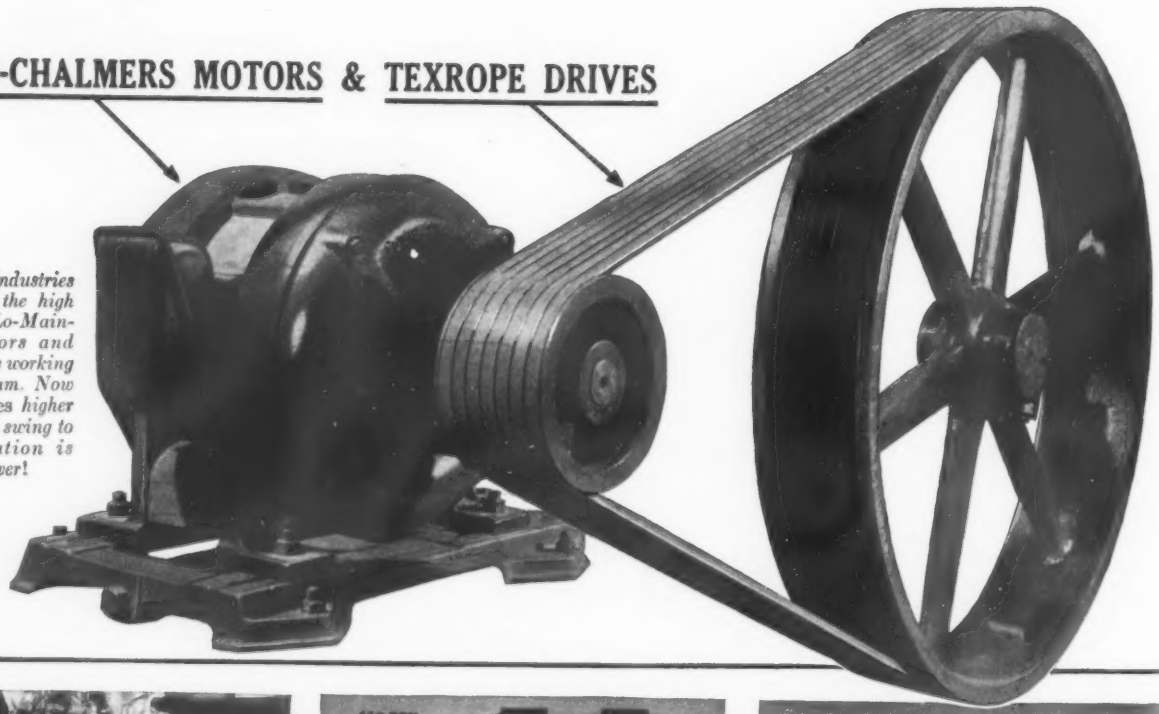
...D COMPANY BRIDGEPORT CONNECTICUT

Telegraph your inquiries with Contract and Priority data for prompt action

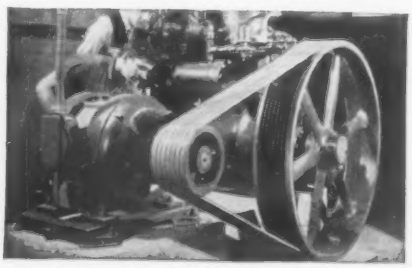
IN PEACE AND WAR--

Give this an "E" for

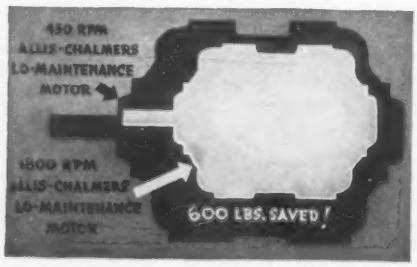
ALLIS-CHALMERS MOTORS & TEXROPE DRIVES



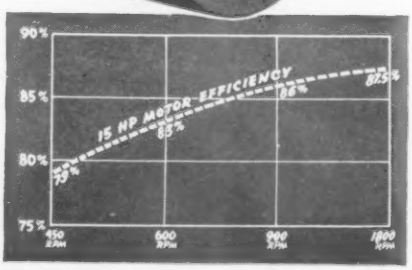
Thousands of industries already know the high efficiency of Lo-Maintenance Motors and Texrope Drives working together as a team. Now that war forces higher efficiencies, the swing to this combination is stronger than ever!



1 In most applications, an 1800 rpm motor with Texrope Drive will ably do the job of a lower-speed, direct-connected motor —at lower cost in money *and materials!*



2 When you buy an 1800 rpm instead of 450 rpm 15 hp squirrel-cage motor, for example, 600 lb are saved. And *you* save well over $200 — with drive figured in!



3 Note that efficiency rises from 79% for the 450 rpm motor to 87.5% for the 1800 rpm motor. The 1800 rpm motor saves you over 30 kw/24 hr. day.

WE WORK FOR VICTORY — WE PLAN FOR PEACE

ALLIS-

Combination Efficiency!

☛ Using high-speed motors with Allis-Chalmers Texrope Drives and single-speed motors with Allis-Chalmers Vari-Pitch Sheaves and Speed Changers has always been good practice. Today it's a vital practice!

☛ Such combinations give sharply higher efficiencies —at lower cost in man-hours, money and materials!

☛ As America's only builder of both motors and V-belt drives, Allis-Chalmers has long studied and advocated their use in proper combination.

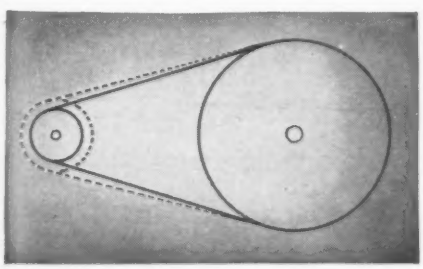
☛ Today you benefit from Allis-Chalmers pioneering when you ask for — and get — the right combination of Lo-Maintenance Motor and Texrope Drive!

BUILDING the largest variety of capital goods in the world, Allis-Chalmers know-how is in many ways unique — and is *completely* at the service of American war industry.

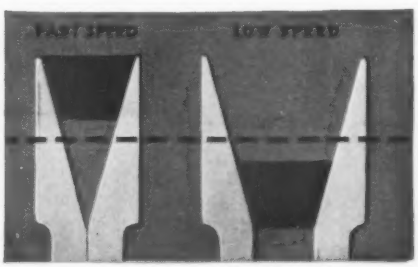
Allis-Chalmers, builder of Lo-Maintenance Motors, *originated* the multiple V-belt drive and Vari-Pitch Sheaves.

Today there's every patriotic *and business* reason for using material-saving, money-saving single speed and high-speed motors — made flexible and more efficient by Texrope Drives.

Don't hesitate to call on Allis-Chalmers district offices for engineering data or recommendations — or write direct to ALLIS-CHALMERS MFG. CO., MILWAUKEE, WISCONSIN. A 1581



4 Infrequently needed speed changes can be had by changing from one size motor sheave to another. Juggling *complete* drives, range is 1:1 to 7:1.

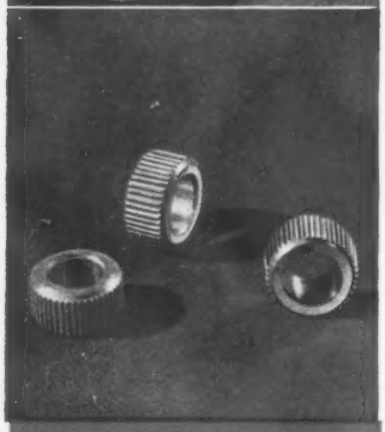


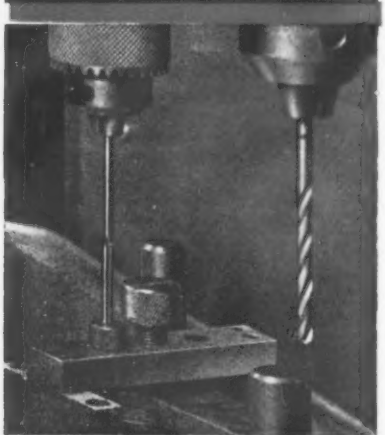
5 With the Allis-Chalmers Vari-Pitch Sheave, you can increase or decrease speed by adjusting sheave diameter . . . obtaining an *unbroken* series of speeds!

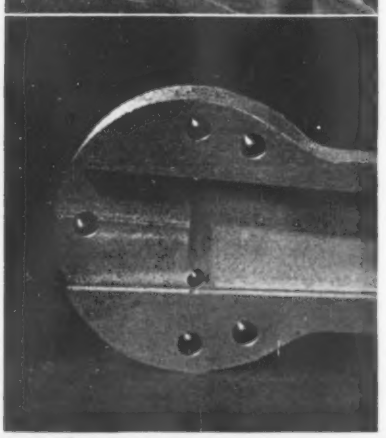
6 Allis-Chalmers Vari-Pitch Speed Changer gives you infinite changes at the turn of a wheel — within 3.75 to 1. It's compact, flexible, *efficient!*

CHALMERS

LO-MAINTENANCE MOTORS
TEXROPE DRIVES







REAM BETTER HOLES

from .050" to .500"

with

BARBER-COLMAN

Ground-from-Solid

REAMERS

THESE solid fluted reamers will provide maximum accuracy in the range from .050" to .500". Cutting diameters are guaranteed within + .0002"/— .0000", but many will run even closer than that. In each case, the individual reamer is engineered for the job it is to do, thus assuring maximum cutting ability and longer life. B-C Ground-from-Solid Reamers are made from hardened blanks, centerless ground to specified cutting diameter, and then fluted from the solid. This method avoids all hardening distortion and provides these advantages: • There is no possibility of inferior, minutely dubbed cutting edges which may result when teeth are cylindrically ground after fluting. • The diameter is accurately established within tenths before the flutes are ground, making it unnecessary to measure across the flutes. • Smoother finish results on the cylindrical cutting land. There is no intermittent grinding as when reamers are fluted and then cylindrically ground to size. ★ *If you have fine precision work such as aircraft parts, guns, instruments, or small textile machinery parts requiring reamed holes, send us your prints for quotations and recommendations.* At present we have facilities available for delivery in approximately 8 weeks depending on priority rating available.

The photographs in the panel above show B-C Ground-from-Solid Reamers in operation and the finished parts. • The upper views show an aircraft part of nitralloy steel requiring a .2508"/.2510" hole with fine finish. • The lower views show a textile machinery part requiring holes .1880"/.1885" in cast iron.

Buy War Bonds

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HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

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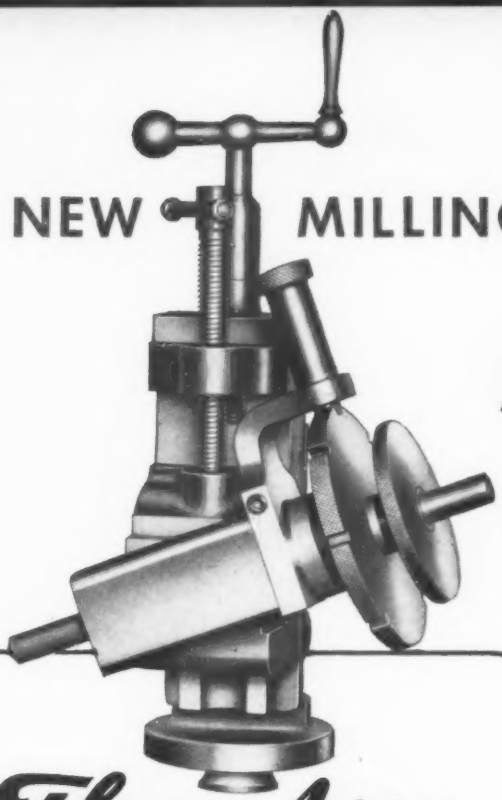


..A NEW MILLING FIXTURE WITH

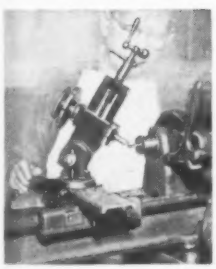
Fool Proof INDEXING

Set this time saver up on any bench lathe — slip on a stock index plate — and the most inexperienced operator can produce indexed work with no chance for error through miscalculation.

The 3-way swing provides exceptional maneuverability, so that it readily produces a wide variety of end mills, special cutters, reamers, splines and punches. Plain milling of flat stock may also be accomplished by using the sturdy vise without indexing unit.

Awarded to AUTO-ORDNANCE CORPORATION for excellence in production of "Tommy Guns."

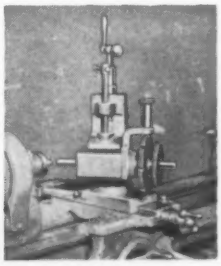
Thompson UNIVERSAL MILLING FIXTURE



dex Fixture tilted at 30° mill- g end teeth in Taper Reamer.

Fixture and Base at right angles milling straight teeth in cutter.

e of Fixture on 30° angle lling end teeth in cutter.



End Mill operation showing work extended thru fixture.

Thompson

AUTO-ORDNANCE Corporation

THOMPSON TOOL DIVISION

342 WEST PUTNUM AVENUE

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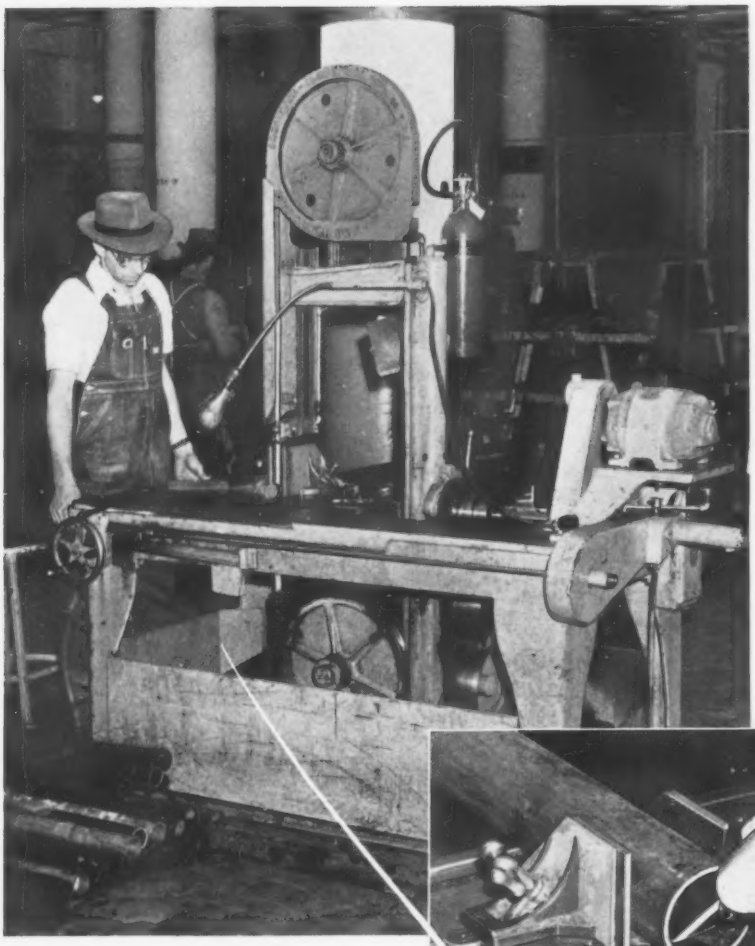
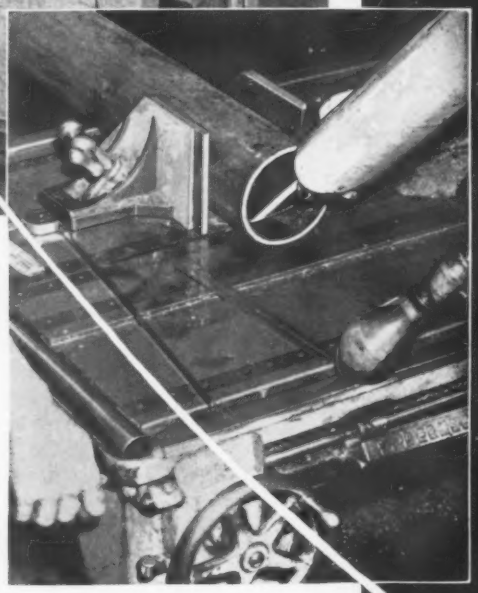


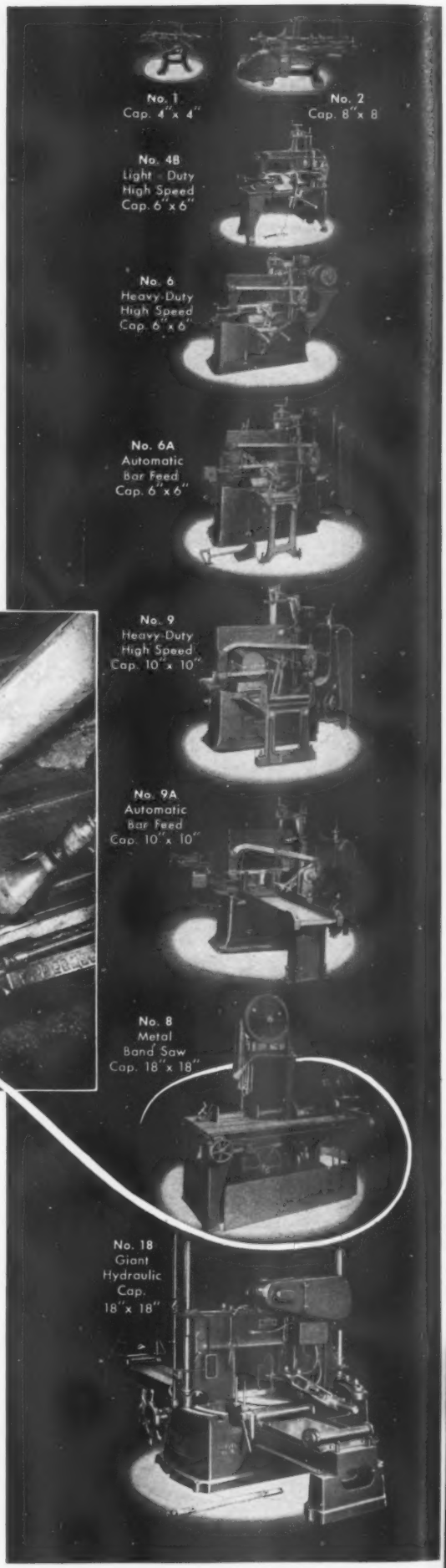


at

Vultee Aircraft

--"cuts can be made that are not obtainable on any other saw!"

At Vultee Aircraft Inc., this MARVEL No. 8 "has a very wide use" and "has proved a very efficient machine," for it is in continuous use sawing Pipe—all diameters; Bar stock—both machine stock and tool steel; Structural steel—angles and shapes and Steel Plate. What other saw could make the angle cut illustrated in the close-up but the universal MARVEL No. 8 Metal-cutting Band Saw on which the blade feeds into the work at any angle from 45° right to 45° left!



MARVEL SAWS

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

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Universal Camming means that CLEVELAND AUTOMATICS

The proportion of productive time against set-up in a Cleveland Automatic is a profitable one. Everything from regulating drum to stock feed adjustment is within comfortable working reach.

EVERY operation on a Cleveland Single Spindle Automatic is controlled by standard cams, easily reached and quickly set to any position with the aid of a universal adjustment feature, shown in the large illustration. Set-up time is reduced to a remarkable minimum by the speed and ease with which tools can be readied for processing of any job within the scope of the machine.

Immediate adjustment close to the final limits reduces the set-and-try time wasted in old fashioned equipment. All adjustments are in comfortable working reach. In the 5¾-inch Model A, quick-reading scales on the regulating drum, the cross-slide drum, independent cut-off cam and stock feed, further simplify the set-up man's job.

With men responsible for production, Cleveland Single Spindle Automatics have a reputation for two important advantages:

1. Maximum sustained production on long runs, with minimum down time for adjustments.

2. Profitable economy on small lot, short run jobs.

Clevelands are proving in hundreds of war plants that they cut costs *and* speed production.

THE CLEVELAND AUTOMATIC MACHINE COMPANY

CLEVELAND, OHIO

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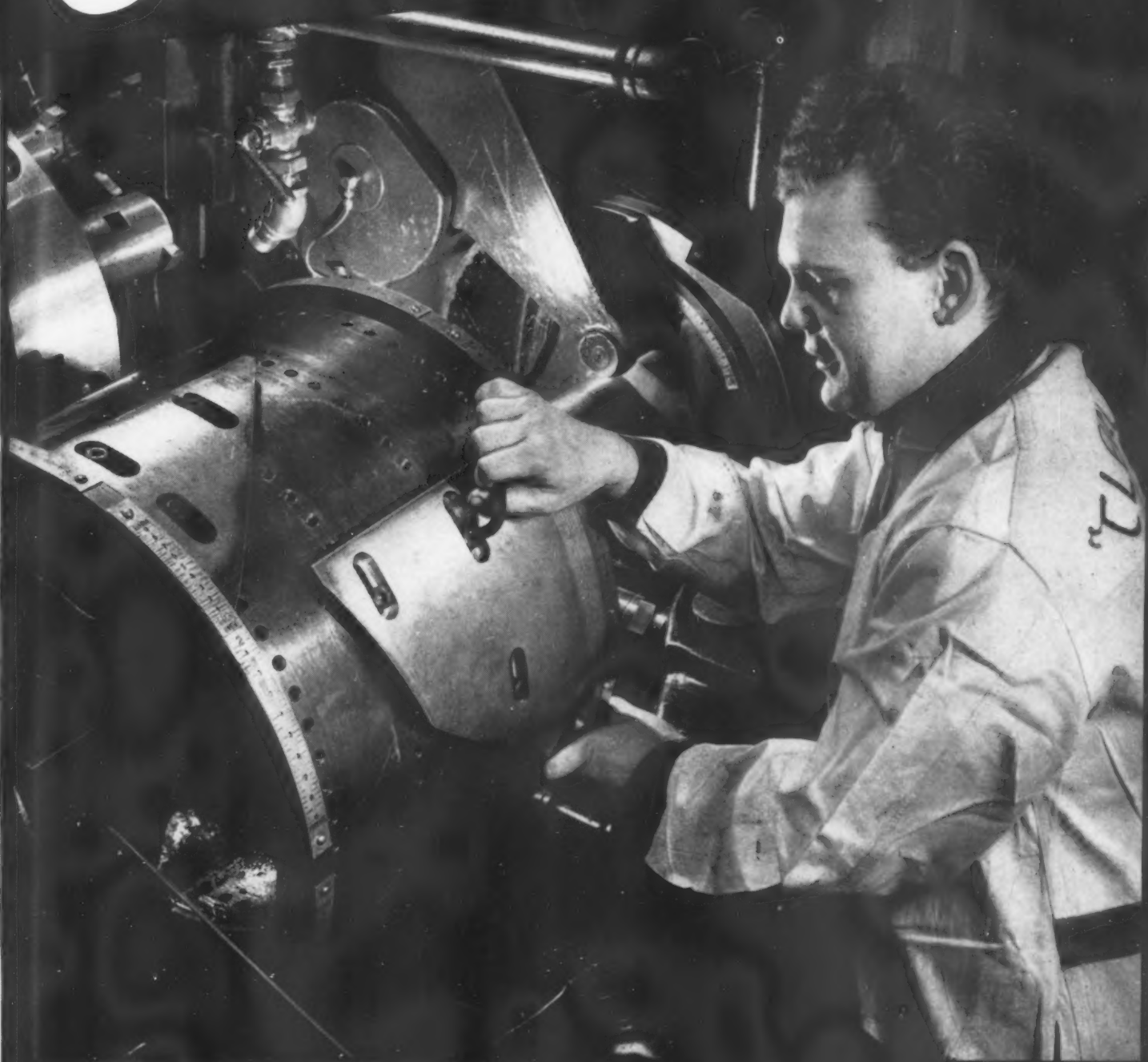
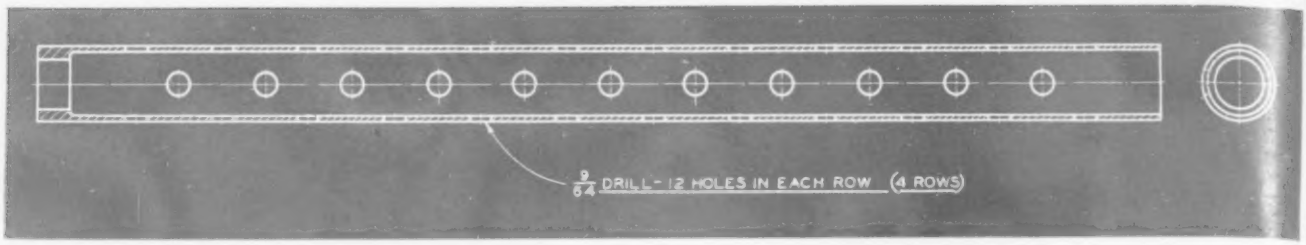
Cut Costs



CLEVELAND *Single Spindle* AUTOMATICS

MODEL A—Built in 1 1/16-inch to 9 1/2-inch capacities inclusive

MODEL B—Built in 1 1/16-inch to 2 1/2-inch capacities inclusive



A FLEXIMATIC

by KINGSBURY

JOB ... SPEEDING NAVAL ORDNANCE PRODUCTION!

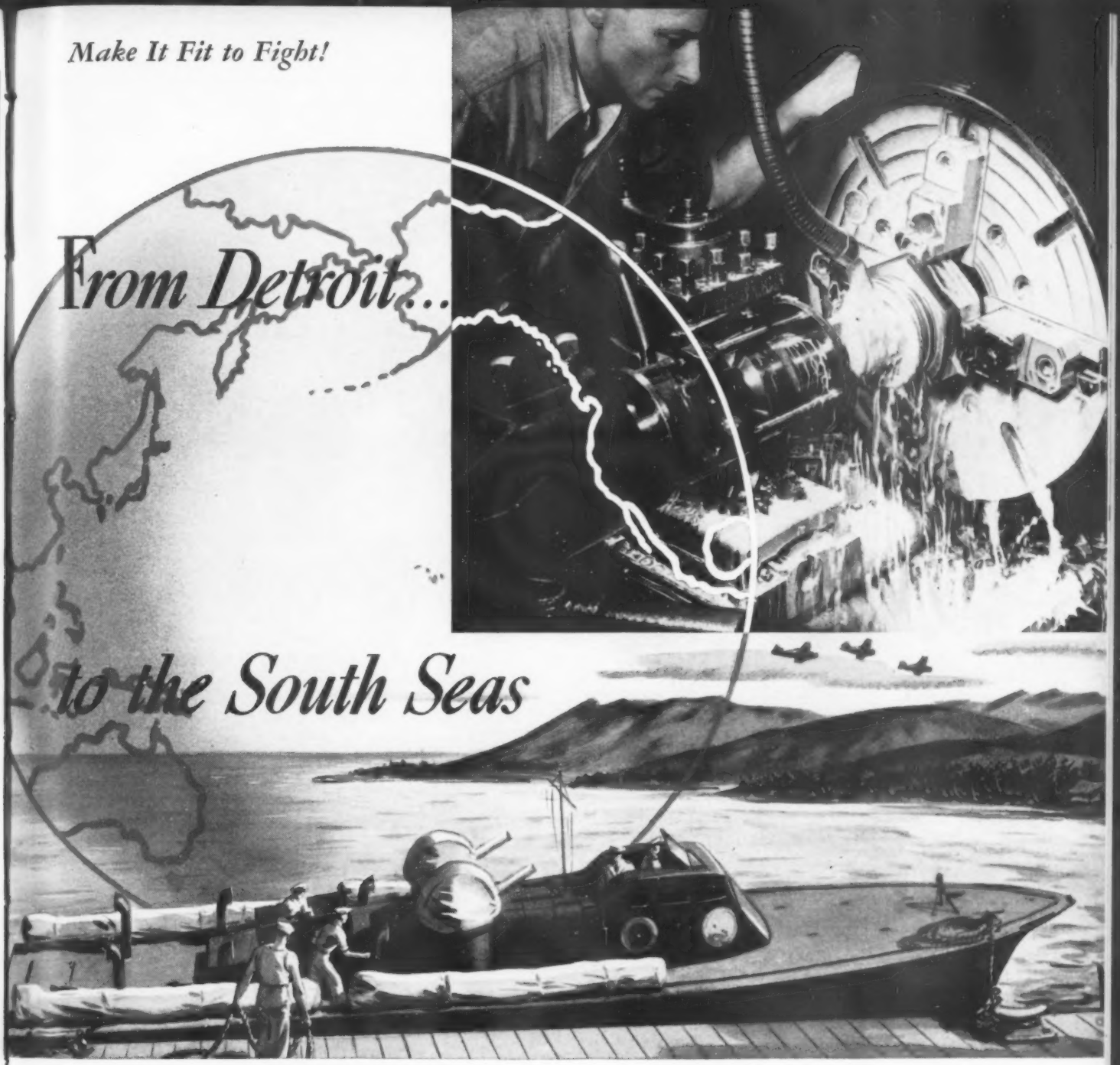
When the call came for machines capable of turning out munitions and aircraft parts at mass-production speeds, Kingsbury FLEXIMATICS were ready! Quickly made up of standard units mounted on standard bases. FLEXIMATICS can perform drilling, tapping, reaming and many other operations in **any** position or at **any** angle on **any** part that can be chucked. For example, all 48 holes are produced in the flash tube shown above in a single chucking of the work. Each work holder on the main turret is in itself a turret which indexes as the main turret indexes, thus enabling the rows of holes to be drilled at four positions on the tube without removing the work. Various lengths of tube can be handled by the machine by adjusting the position of the top clamping member.

Speeding war production by making it possible for semi-skilled labor to turn out large volumes of precision parts, Kingsbury FLEXIMATICS possess the added advantage of FLEXIBILITY that permits quick, easy changeovers to meet changes in design or machining requirements.

KINGSBURY MACHINE TOOL CORPORATION

KEENE NEW HAMPSHIRE U S A

Make It Fit to Fight!



From Detroit...

...to the South Seas

...to fit within .001"

Extreme accuracy is the secret of interchangeable manufacture. Not only in the more rapid mass production of war's implements, but also in supplying replacement parts—for PT boats in the South Pacific—tanks in North Africa—or fighter planes in England.

To put such accurately machined parts *where* they are needed, *when* they are needed, is a job which calls for Gisholt's rigid construction to maintain precision at high cutting speeds.

GISHOLT MACHINE COMPANY
1201 East Washington Avenue • Madison, Wisconsin

GISHOLT

LOOK AHEAD—KEEP AHEAD—WITH GISHOLT IMPROVEMENTS IN METAL TURNING

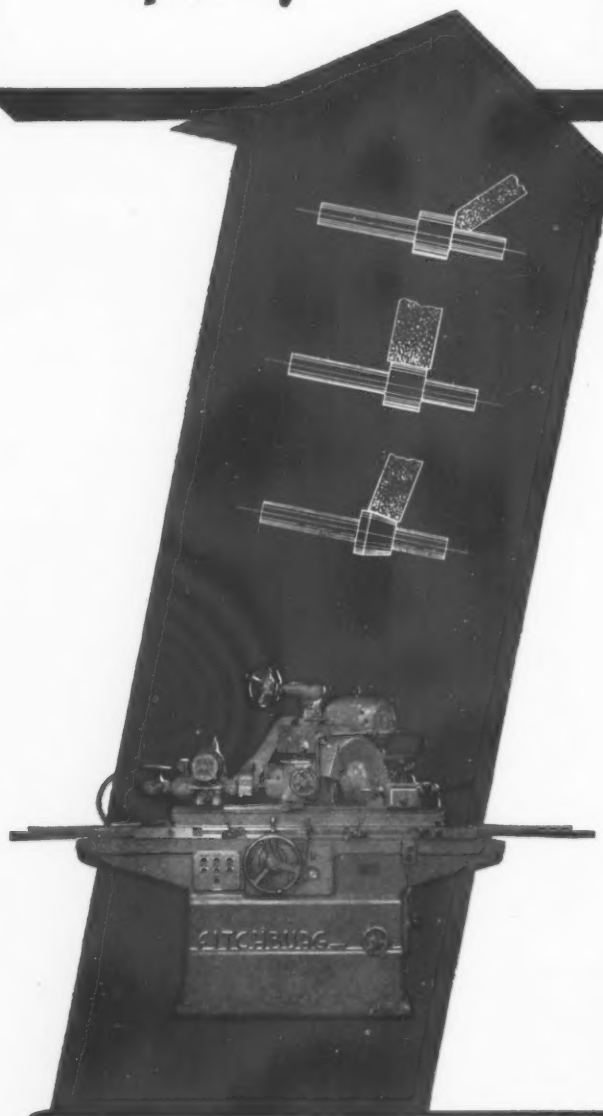
TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES

ARMY E NAVY

At Gisholt, the Army-Navy "E" and the Treasury flag fly side by side.

New FITCHBURG ADJUSTABLE "TYPE C" Angular Head Grinder

FOR PLAIN CYLINDRICAL GRINDING . . . . . FROM 0 degrees to 45 degrees



The Fitchburg Adjustable "Type C" Angular Head Grinding Machine is another single application of the Fitchburg Standard Bowgage Wheelhead Unit. The "Type C" is designed to handle a wide range, and a number of types of jobs. In finding ways to cut your grinding time and costs it will pay to consider what this machine can do.

This newest of Fitchburg plain cylindrical grinders has a Standard Wheelhead Unit mounted so that it may be located to grind from 0 degrees up to a 45-degree angle. Previously angular head grinding machines have been equipped with fixed heads for single purpose grinding. The Bowgage head on the Fitchburg "Type C" is adjustable and can be swivelled to various positions for standard plain grinding, thus providing greater grinding utility. The head goes through a completely automatic cycle — rapid traverse to work, correct feed, grinding dwell and rapid return. The workhead is adjustable for various lengths of work and the work spindle can be equipped for single or variable work speeds. The trueing device is hand operated and mounted on the work table.

The Fitchburg "Type C" grinder is designed to meet war time production speed and maintain highest efficiency. Ease of operation is assured by centralized controls. In every detail it meets all the requirements of plain cylindrical and taper grinding — in large or small lots of work, with assured accuracy and fine finish, at low cost.

Send for new fully illustrated folder — write for it on your business letter-head — it will be mailed free.

FITCHBURG GRINDING MACHINE CORP.

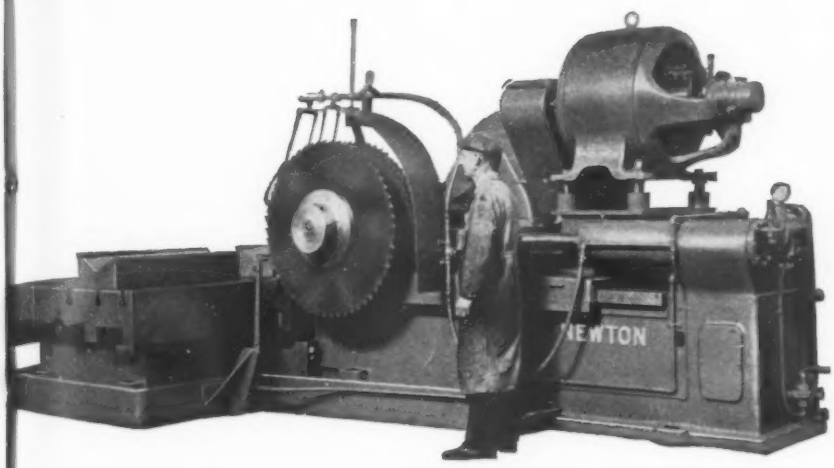
FITCHBURG, MASSACHUSETTS, U. S. A.

Manufacturers of — Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

NEWTON COLD SAWS

IN A WIDE RANGE OF SIZES

Are Speeding Production!



NEWTON COLD SAW CUT-OFF Machines are built in sizes from those using 32" diameter saw blades up to the largest ever built (120" diameter). They are in use in many of the war industry production plants where speed plus accuracy are of vital importance.

They are modern in design and heavy and rugged in construction—the result of many years' experience in building this type of equipment.

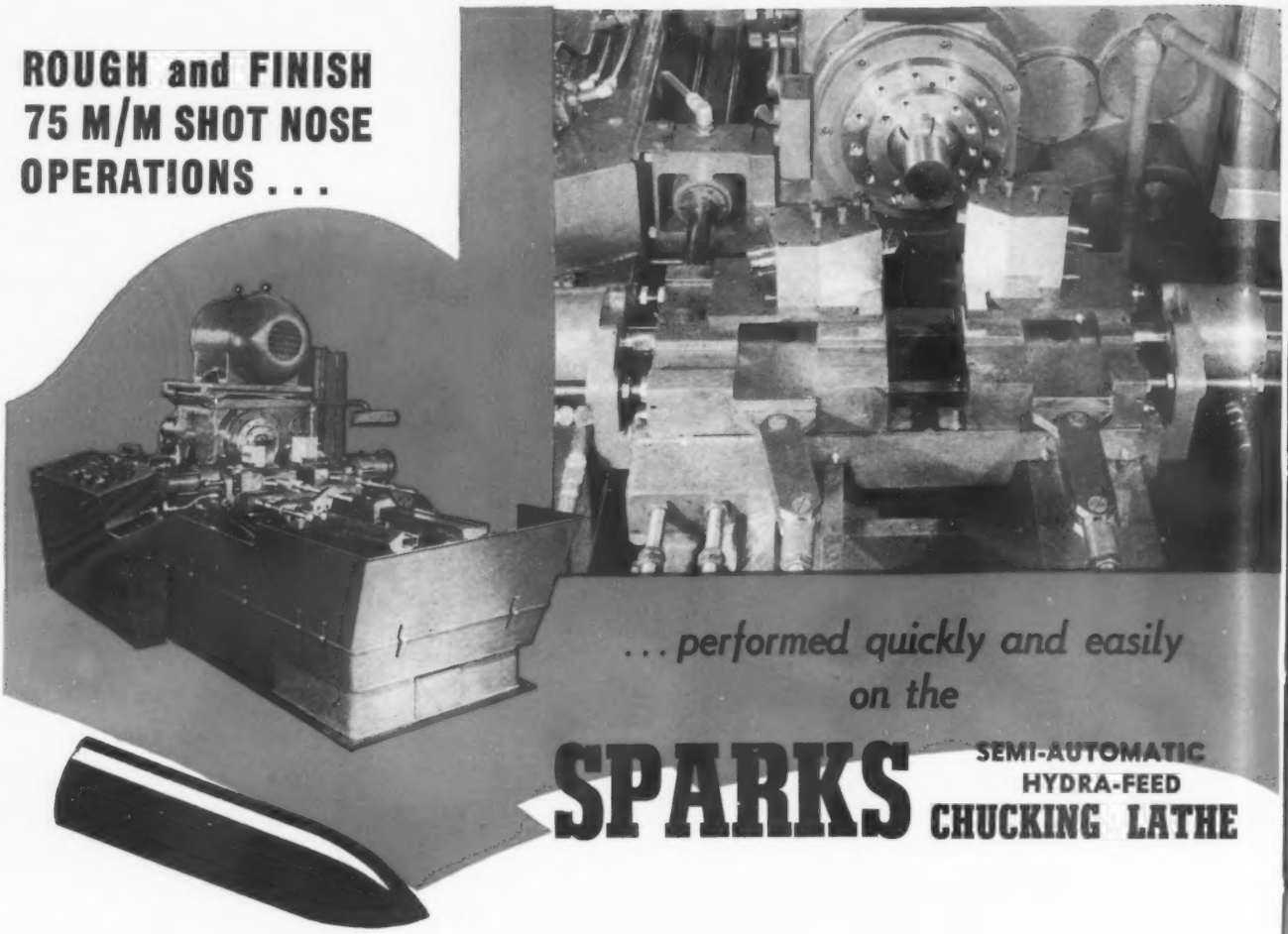
With hydraulic feed to the saw carriage and the saw blade cutting up, higher rates of feed are possible with more cuts for each sharpening of the saw blade.

Details will be sent on request.

BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

CONSOLIDATED
MACHINE TOOL CORPORATION
ROCHESTER, NEW YORK

ROUGH and FINISH 75 M/M SHOT NOSE OPERATIONS . . .



. . . performed quickly and easily on the

SPARKS SEMI-AUTOMATIC HYDRA-FEED CHUCKING LATHE

A SET-UP THAT STEPS UP PRODUCTION

The SPARKS Lathe and set-up shown here provide the means of handling the rough and finish turning of nose contour on 75 m/m S.A.P. shot bodies on a truly high production basis. The tooling set-up made available by the SPARKS design, increased production over previous method by a margin which demands attention by those interested in time saving and manpower. With a slightly different set-up, this machine can easily perform the same operations on 90 M/M shot bodies.

Because of the unusually wide variety of tooling arrangements possible, the SPARKS Lathe is a valuable machine for both today's and tomorrow's requirements. Ruggedness, accuracy and modern features contribute to its outstanding utility and economy for many years to come.

TOOLED FOR TURNING 75 M/M SHOT

This tooling set-up for nose operations is simple, effective and fast. A single carriage having individual, hydraulically operated front and rear cross slides is provided. Cross slides are timed in exact relation to each other. The nose contour is rough turned by rear tool which is guided by a cam track carried in rear cross slide and acting on the tool slide during longitudinal movement of the carriage. A similar cam arrangement controls front tools during rough and finish turning the same contour. Collet jaws are hydraulically operated and all carriage and tool movements are fully automatic.

CONVENIENCE FEATURES SAVE TIME AND MEN

Metering valves for feed are within easy reach of operator and all other valves are automatically actuated. Non-cutting time is reduced to a minimum. A manual valve operating collet jaws speeds loading and unloading.

Standard SPARKS design includes a 4 speed headstock equipped throughout with ball and roller bearings—a feature which contributes to its wide range of utility.

Write for Full Details

SPARKS HYDRA-FEED LATHE

SPARKS MACHINE TOOL CORPORATION
NORWALK . . . . CONN.

NOW IN STOCK

NATIONAL FINE
NATIONAL COARSE
No. 0—80 to 1″—8
and
PIPE PLUG GAGES
⅛ to ½

CADILLAC
THREAD PLUG GAGES

By concentrating our greatly increased capacity on standard National Fine and National Coarse Thread Plug Gages, we are able to offer these from stock for immediate delivery. Let us serve you ... orders and re-orders from the nation's largest armament manufacturers testify to the accuracy of CADILLAC Gages.

Reasonable delivery on Standard Rings and N. S. Thread Plugs and Rings.

Write, wire or call about your requirements.

CADILLAC GAGE COMPANY • 20316 HOOVER RD. · DETROIT, MICH.

CADILLAC GAGE COMPANY
DETROIT

The Man at the Lathe Fights Too!

. . . and every turn of the spindle, as he guides his work through many precision operations, helps bring Victory one step closer.

Hours spent at a lathe may lack the dangerous excitement of combat—but the valorous men on the battle fronts breathe a prayer of thankfulness for guns, shells, planes, tanks—for all the superb equipment which is helping them swing the tide against the Axis.

So the man at the lathe is a soldier, too, as he bends his shoulders to the task of pouring out weapons in an ever-increasing stream. He faces his task grimly . . . proudly . . . proclaiming by the gleam in his eye and the jut of his jaw that he will not be outdone in service to his country, and knowing that America's production is a decisive factor in the war.

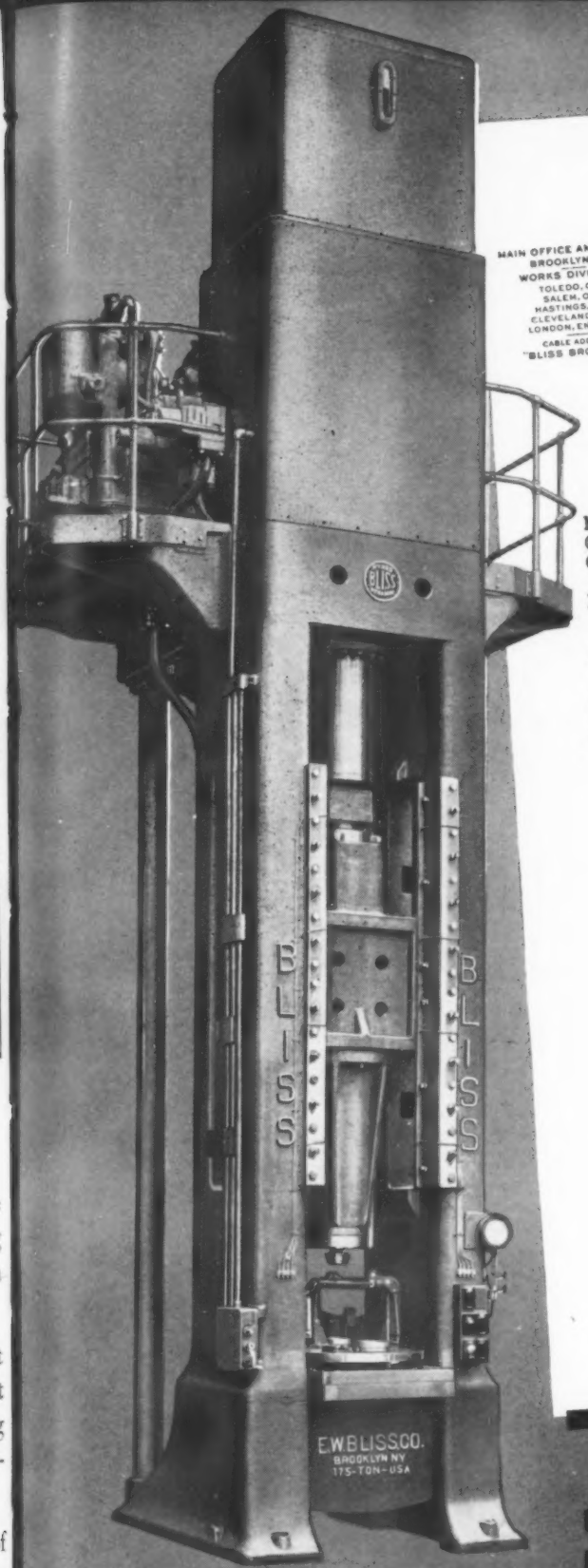
To help America "tool up for Victory," the output of South Bend Lathes has been increased (we can't say how much) in the last year and a half—giving the man at the lathe the efficient, dependable production weapon he must have to win.

There is a South Bend Lathe for every class of work—engine lathes, toolroom lathes, and turret lathes. Write now for our new catalog No. 100B in which the entire line is illustrated and described.

SOUTH BEND LATHE WORKS

LATHE BUILDERS FOR 36 YEARS

SOUTH • BEND, INDIANA



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AUTOMATIC CAN MACHINERY
DIES, SPECIAL MACHINERY

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CHICAGO
PHILADELPHIA
ROCHESTER
NEW HAVEN

ENGINEERING *for* PRODUCTION

Mr. Ro
Consol
Chicag

Dear M

After [illegible] are happy to recommend equipment [illegible]

As you know, tapering of large cartridge cases presents the problem of handling, and on the ordinary press, requires considerable time for loading and unloading the case. Features of the press equipment recommended are outlined below:

Dial Feed Hydro-Dynamic Tapering Press

1. Ample loading time; no lost press time
2. Shockless and jarless operation of dial
3. Production of 7 to 10 per minute
4. Fully automatic operation of the entire cycle
5. Perfect alignment
6. Tapering to shoulder
7. Safety interlocks on controls throughout
8. Automatic hydraulic ejection
9. Same rigidity as on Bliss cartridge case presses
10. Adjustable for different size cases

Illustrations of this press in the 175 ton 60" stroke size are submitted and a detailed quotation attached. We hope that we will have the pleasure of hearing further from you.

Yours very truly,

[illegible] BLISS COMPANY

DIAL FEED
HYDRAULIC
TAPERING

MARQUETTE · BLISS · TOLEDO · CONSOLIDATED ·
BLISS BUILT

W. BLISS CO.
Street and Second Avenue
OKLYN · NEW YORK

BLISS

GEAR PRODUCTION *Shifts into High*

Photo by
Office of War Information

SUNICUT

"permits up to 83% more tank gears cut per tool change"

Gears to drive America's steel "war horses" at break-neck speeds through sand, mud, and snow. That's the wartime job of a certain large eastern manufacturer producing gears for tanks . . . and he's doing a better job thanks in part to Sun Oil Engineers and Sunicut.

Early in the war effort this manufacturer decided his production rate had to be stepped up. He called a Sun Doctor of Industry—a metal working expert—who studied conditions and recommended a change in cutting lubricant. Sunicut, the transparent sulphurized cutting oil, was tested and adopted. Production soared! With Sunicut they are now able to cut as many as 83% more gears between tool changes.

Production increases like this are not uncommon when the exceptional metal-wetting and heat-absorbing qualities of Sunicut go to work on tough jobs. Whether you make gears or bullets or bomb fuses, if it's increased machine tool production you want, call in a Sun Doctor of Industry. His services and the products he offers are yours to use to turn out more and better war materials . . . faster. Write

SUN OIL COMPANY • ***Philadelphia***
Sun Oil Company, Ltd., Toronto and Montreal, Canada

SUNOCO

SUN PETROLEUM PRODUCTS *HELPING INDUSTRY HELP AMERICA*

APR

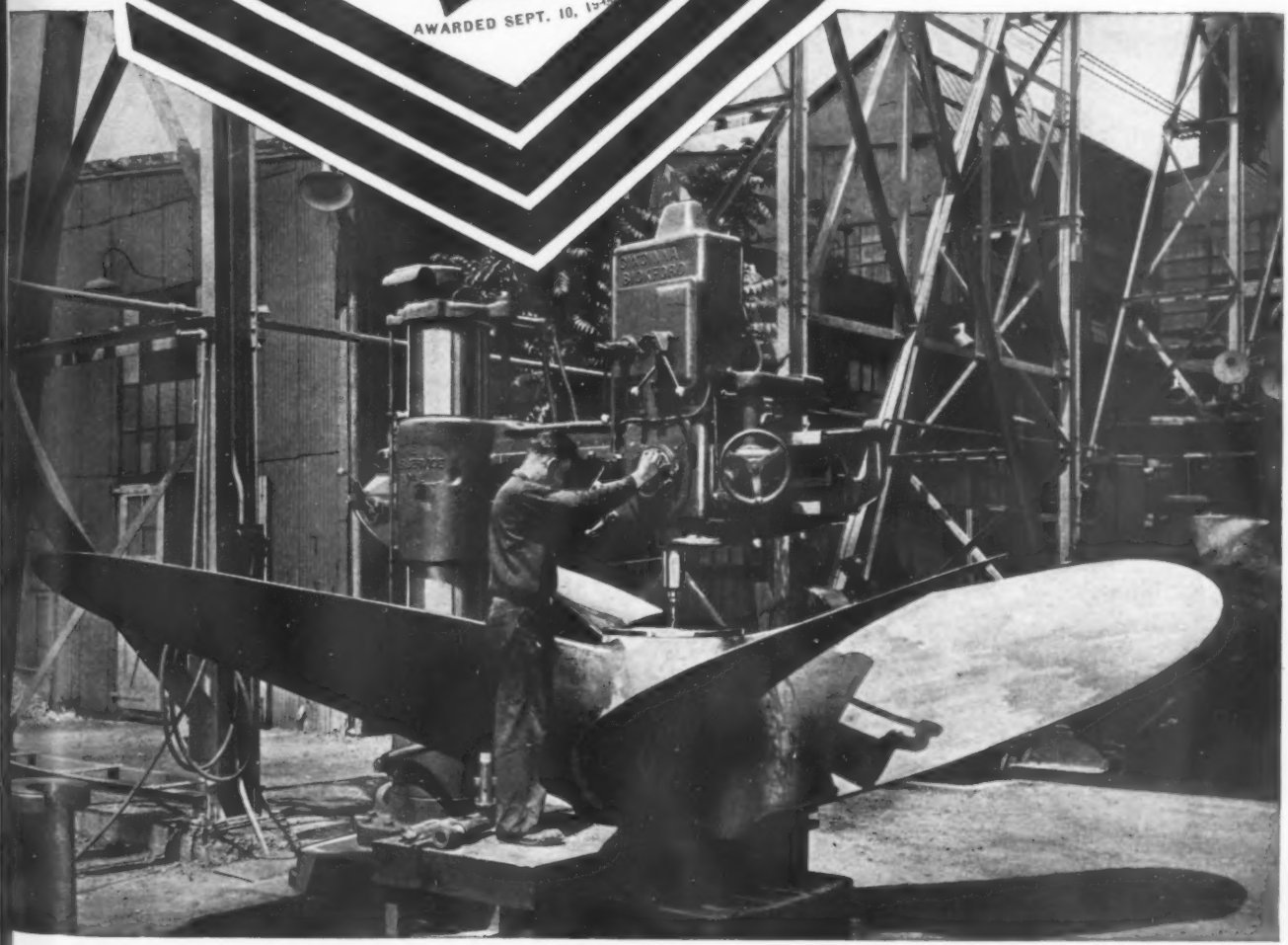
PROPELLERS

In a well known eastern plant, war orders for Liberty Ship and Tanker propellers required fast retooling. Before a building could be erected for this work, propellers were in production—as attested by this outdoor setup. The machine is an early type Super Service Radial, applied to the drilling and tapping of 12 holes in the hubface. Precision locating from the keyway was specified, and a circular drill jig insured accurate center-to-center distances of all stud holes. Super Service Radials are applied to countless similar precision war jobs, often performing yeoman service 3 shifts per day, 7 days per week. The Super Service Radial's productivity, capacity, adaptability, reliability, accuracy and convenience are features of inestimable value to the war effort. Detailed information upon request. The Cincinnati Bickford Tool Co., Oakley, Cincinnati, Ohio.

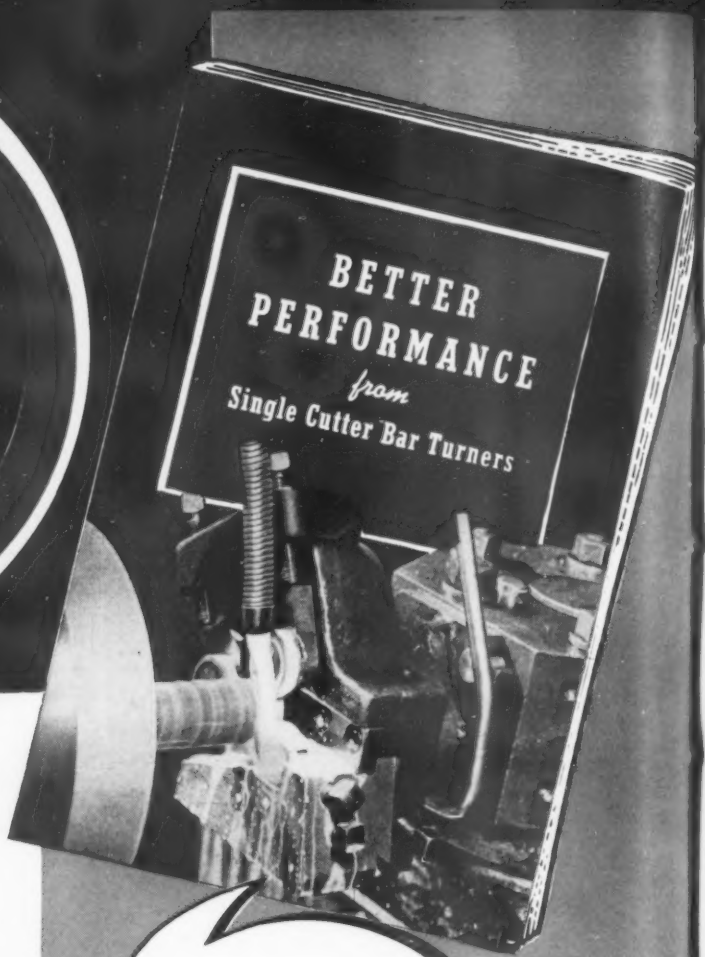
SUPER SERVICE RADIAL

ARMY E NAVY

AWARDED SEPT. 10, 1942



DO YOU REALLY KNOW YOUR BAR TURNER?



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WHAT'S IN THIS ISSUE

PROJECTION FOR PRECISION

To attain precise measurements when checking the accuracy of parts made on form cutters or hobs, the Barber-Colman Company has developed projection equipment, special checking fixtures and inspection techniques which make it possible to hold tolerances of 0.0002 in. on form and 5 min. on angles. The development of this equipment is described by Walter Stewart of that company. Page 78.

DRAFTING DORMANT SCRAP

Tools and materials kept in bins, drawers and lockers, just "in case we might need them," are not pulling their weight in the war effort. Such was the theory behind the drive conducted by General Electric plants in addition to

H. O. WATJEN

their regular scrap reclamation efforts. How committees were formed and functioned and the success of their efforts is the subject of an article by H. O. Watjen, Supervisor of Salvage, Plainfield Works, General Electric Company. Page 87.

GRINDING MAGNESIUM

There are certain precautions to follow when grinding magnesium. The dust when mixed with the proper proportions of air forms an explosive mixture; therefore, grinding magnesium dictates the use of safe dust collectors with water or oil sprays that precipitate the dust into a sludge. Then too this sludge must be maintained wet until disposed of safely. These factors, as well as others that overcome the fire hazard when working this metal, are included in the last of a series of articles describing magnesium machining practice. The author is A. M. Lennie, Dow Chemical Co. Page 82.

WELDED DIES ARE CHEAPER

Complicated dies with three curves, each in a different plane, may be fabricated from steel plate at less than half the cost of producing them from cast iron. The general procedure for planning and making welded dies is told by Walter E. Klauberg. Page 85.

TWO-WAY PARTING

A die mold with a two-way parting of the die sections proved to be the solution of the problem of producing a complex aluminum die casting with bosses cast on the inside surface and an irregular contour on the outside surface. Using a mold that parts both vertically and horizontally, Westinghouse Electric & Manufacturing Company's Springfield, Mass., plant is producing castings with rejects at less than 1 percent on 90,000 parts. Harry Thornton, Die Casting Division, Westinghouse Electric & Manufacturing Co., describes the development of this die. Page 92.

ANTI-RUST FOR STEEL SHELLS

High-quality phenolic varnishes, accurately applied to steel shell cases, solve the problem of protection against corrosion without resort to use of vital metals previously used for coatings. The requirements these varnishes must meet and the performance requirements of equipment for their application, are described by R. H. Smutzer, Paasche Airbrush Company. Page 80.

STEEL SHIFT SPEEDS SHAFTS

Shifting to a steel of different specification, Buick is saving 60 percent of the nickel formerly consumed in production of Pratt & Whitney crankshafts and at the same time more quickly and easily turning out a shaft that is stronger and tougher than the old one. Changes in heat-treating practices are described by Herbert Chase. Page 75.

PRODUCTION WITH A VENGEANCE

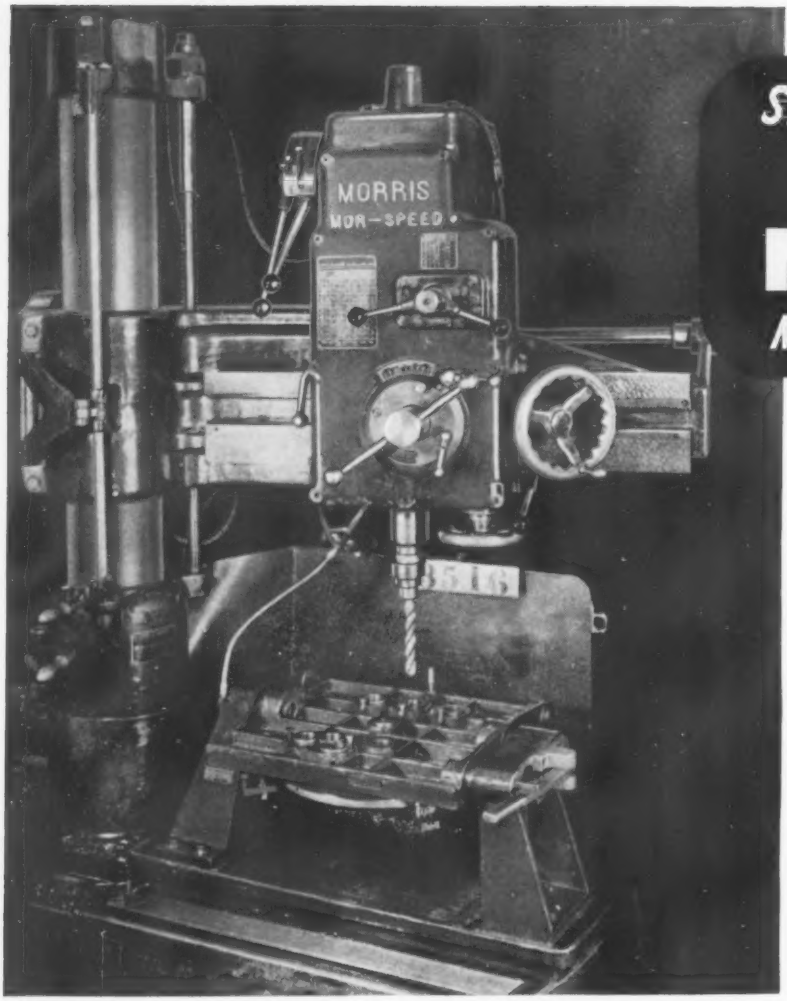
Precise timing goes side by side with accurate workmanship in the plants producing "Vengeance" dive bombers; assembly operations have been divided on the basis of careful analysis, so that work at the various

ROBERT McCULLOCH

stations is completed in about the same amount of time and there is neither waiting for, or piling up of, parts or subassemblies. Vultee Aircraft, Incorporated, has made extensive use of major subassemblies to expedite production and to shorten final assembly time. Scheduled deliveries to each assembly station of parts, divided into kits sufficient to complete one unit, facilitate handling and ease toolroom work. To aid inexperienced workers, there are posted at each assembly station position sheets and isometric sketches or marked photographs; these show how the various parts fit together, and give other information that will aid the new employee. Workers are further guided by a system of disks hung beneath the name of each, designating the work each is to do. The time studies, subassembly techniques, precision scheduling and other production expediting methods utilized, are described by Robert McCulloch, Division Manager, Nashville Division, Vultee Aircraft, Incorporated. Page 77.

COMING

The milling of armor plate, to meet the performance and production demands of this war, was almost an entirely new field. To derive the proper knowledge and techniques, studies were made and careful statistics kept. It was early found that milling of armor plate carried many concepts widely divergent from normal machining practices. Designs of tools that will successfully work such tough, stringy material were derived. The findings of these studies will be the subject of an article to be published in an early issue.



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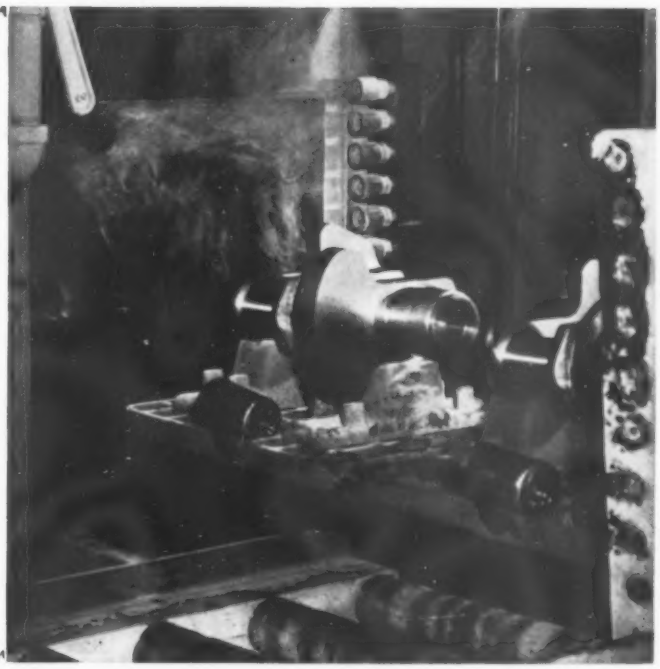
Machine Work Saved by Buick Change in Heat-Treating

Changing the steel specification saved 60 percent of the nickel used in P&W crankshafts. Also saved were several finish operations. With the new steel and the hardening process detailed here, crankshafts come out stronger, tougher, faster



BY HERBERT CHASE

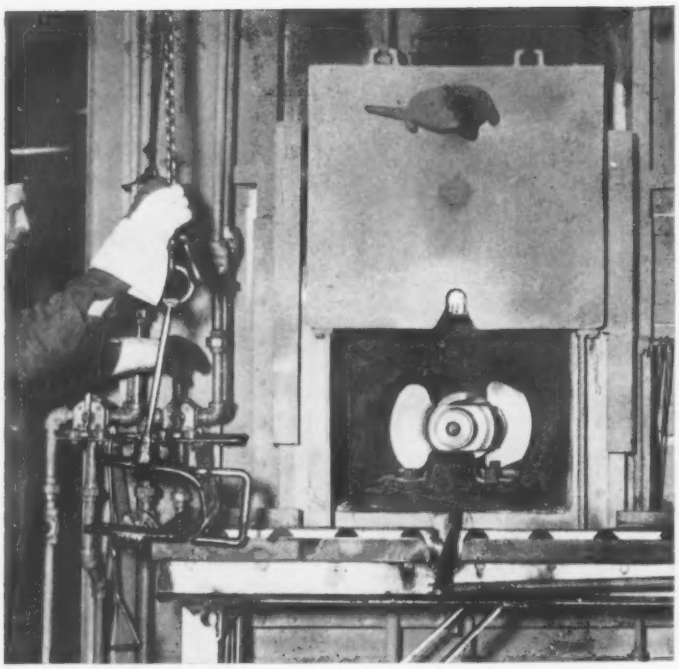
WHEN BUICK CHANGED from a carburizing grade to a medium-carbon alloy steel to save 60 percent of the nickel required for Pratt & Whitney crankshafts, process difficulties resulting from heat-treatment largely disappeared. The new steel crankshafts, heat-treated in pusher-type Surface Combustion furnaces, not only save nickel and sharply reduce the number of finish machining operations, but are stronger and tougher than the old. Tendency to warp is so slight that all but 0.060 in. can be removed from machined surfaces before heat-treatment.

In production of the original SAE 2515 crankshaft, Buick found that copper plating did not mask those portions of the rough-machined crankshaft that should be unaffected by the carburizing process. Thus it was necesseary to perform an extensive group of finish machining operations to remove the case on surfaces other than the crankpin journals. In addition, the carburized shaft had a tendency to warp in subsequent heat-treatment, which introduced the problem of quenching in a fixture.

With the new steel, all of these troubles have disappeared. The only disadvantage that crept in with the change is the difficulty of drilling and tapping the hardened workpiece.

Early in the engine program, Buick used box-type furnaces for crankshafts and other P&W parts. Present output is so great, however, that crankshafts are now hardened exclusively in pusher-type Surface Combustion equipment. Furnace temperature is maintained by radiant tubes fired with natural gas, making it possible to provide a neutral atmosphere within the muffle. For this purpose, General Electric's "Drycolene" is employed (75 percent nitrogen, 22 percent CO and approximately 3 percent hydrogen, the CO_2 being kept between 0.0 and 0.2 percent).

To avoid leakage of air into the muffle, vestibules are provided at the entrance and discharge ends of the



At the discharge end of the S-C hardening furnace, an operator moves a special tong into place to pick the crankshaft off the tray and transfer it to the quench

Crankshafts are quenched in the horizontal position, with the tong suspended from a crossbar and supporting the work at the central throw

S-C furnace. When either vestibule is opened, an inner door is closed and natural gas is burned in the vestibule to form a reducing atmosphere.

Crankshafts are carried through the pusher furnace on trays (one part per tray) provided with fixtures that support the work. A roller conveyor returns unloaded trays from the discharge end to the loading area.

The temperature within the furnace muffle is so graduated that the work enters a zone maintained at 1200 F. and is raised to 1500 F. by the time it reaches the discharge end. About one hour is required for the crankshaft to reach the required temperature, and the remaining two hours in the cycle constitute a soaking period. A considerable number of workpieces is within the furnace at all times because charging is done at 9 min. intervals.

When the discharge vestibule receives a heat-treated crank, a helper pulls the tray out upon the return roller conveyor. Thereupon, the discharge operator slips a special tong under the central throw to transfer the part to an oil tank for quenching in the horizontal position. The tong has an eye through which a bar is passed to suspend the crankshaft in the oil, and permit the chain hoist to be removed for the next piece.

Quenching is done in oil. When the part is cooled to the temperature of the recirculated oil in the quench tank, it is removed and cleaned with steam and hot water before drawing.

Because of the high production involved, crankshafts are drawn in a chain-conveyor type furnace designed by Industrial Heating Equipment Company. This furnace is heated with natural gas, and the products of combustion are recirculated by fans. Two trays, each carrying two parts, are pulled through the furnace side by side by means of four chains. Crankshafts are in the furnace for six hours. Since the operating temperature is 920 F., it is not necessary to use controlled atmosphere to prevent scaling the work.

Propeller Shaft Forging

The next largest steel forging in the P&W engine, the propeller shaft, is also made from a new steel. As with the crankshaft, all rough machining is done prior to heat-treatment. Since, the pusher-type S-C furnace operates 24 hours daily on crankshafts exclusively, the propeller shaft is hardened on a batch basis in General Electric box furnaces holding six pieces each. The temperature is maintained at 1500 F. by electric resistors, and the Drycolene atmosphere mentioned is supplied at the rate of 200 cu.ft. per hour. Three trays, each holding two pieces, are loaded into the furnace for a two-hour cycle (the sections are thinner than in the case of the crankshaft).

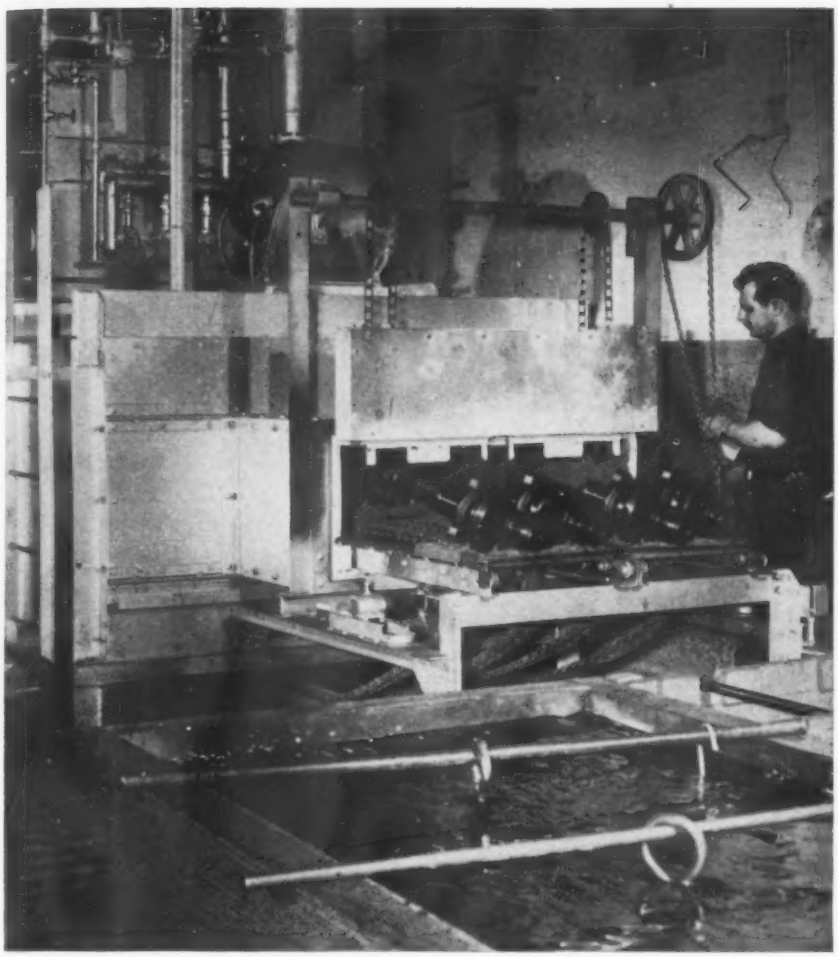
Quench tanks are located across the aisle from the battery of box furnaces. Propeller shafts are transferred to the quench with hoists and plunged vertically into the oil. Upon removal, they are washed in hot water and placed in the draw furnaces.

Hardening furnaces and drawing furnaces are alternated in the battery for a convenient working arrangement with the quench tanks. To balance production with the related hardening furnace, each draw furnace holds twelve shafts, since a four-hour cycle at 975 F. is required.

Drawn propeller shafts are inspected with Tinius Olsen hardness testing machines which measure the diameter of impression. This is required to be approximately 3 mm. for propeller shafts and the same for crankshafts. A test piece (cut from the part during machining) accompanies each shaft through the heat-treatment process so that the physical properties can be checked. These test pieces carry the same number as the shaft and also the number of the heat from which the steel was produced. The following minimum properties must be disclosed by the heat-treated test pieces.

	Propeller Shaft	Crankshaft
Yield strength, lb. per sq. in.....	150,000	170,000
Tensile strength, lb. per sq. in..	170,000	185,000
Percent elongation in 2 in.....	11	10
Percent reduction of area.....	35	30

Many of the smaller parts used in the 1200-hp. P&W engine require case hardening, which is done in vertical

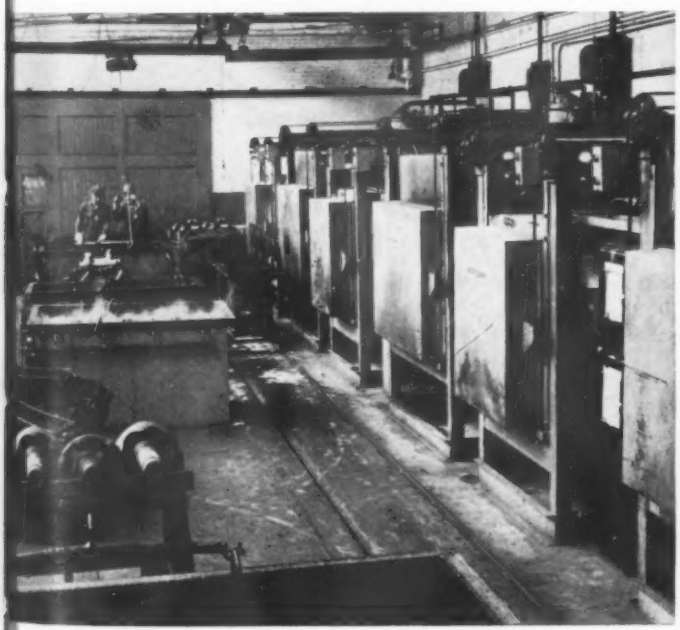


Labor is used effectively by employing a continuous furnace for drawing the crankshafts. Chains are employed in this Industrial Heating Equipment Company furnace to move the work trays

batch-type carburizing furnaces of varying capacities. These are fed with a mixture of gas amounting, per hour, to 85 cu.ft. of which 80 cu.ft. is Drycolene and 5 cu.ft. is natural gas, the latter being the carburizing agent. Temperature is maintained by electric resistors and is held at 1650 F. Natural gas has proved to be much cheaper than the liquid-carburizing agent formerly used and gives a better control over the depth of the case and also over the carbon concentration in the case. The latter is important, as checking may be brought about in grinding if areas having high carbon concentration occur. It requires a total furnace time of 4 hours to produce a case 0.030 in. thick and 5 to 5½ hours for a case 0.040 in. thick.

Nitriding is done on articulated-rod pins in a furnace which holds 1500 of these parts. Ammonia gas is supplied from bottles at 15 lb. per sq.in. Heat is provided by electric elements and the temperature is held at 975 F. The cycle totals 42 hours, of which 31 hours is at full heat. Ammonia is fed at the rate of 15 cu.ft. an hour at the start and increased to 25 cu.ft. an hour when the charge is up to heat.

As this discussion indicates, all heat-treatment is done under exacting control to insure the high quality of product required in aircraft engine work. The equipment described is only that for the parts named. Additional equipment for heat-treating other parts of the engine is in use at the Melrose Park plant where many other parts for the same engine are produced.



Box-type General Electric hardening and drawing furnaces are paired with quench tanks for heat-treating the propeller shaft

Propeller shafts are quenched vertically after heating in electric furnaces to 1500 F. in a two-hour cycle; then washed in hot water

Projection Inspection of Form Tools

Hobs and special form tools are checked precisely by projecting them against large scale drawings mounted across the room. The inspection department is located beside the finish grinding room for the operator's convenience

BY WALTER STEWART, BARBER-COLMAN COMPANY

PRESENT-DAY manufacturing tolerances for many parts requiring form cutters or hobs are so small that very precise measurements must be made when checking the accuracy of these cutters. More than 20 years experience in the projection inspection of such tools in Barber-Colman's small tool division have brought about the development of projection equipment, special checking fixtures and inspection techniques which make it possible to hold tolerances of 0.0002 in. on form and 5 min. on angles. In most cases where projection equipment is not available, such tools can be checked only with templets and then proven by measuring the form cut in a test block, and such close tolerances cannot be held.

When projection inspection first was suggested, we made an experimental set-up to throw an enlarged shadow of a tooth form against an engineering layout drawn carefully to scale. To produce this shadow a conventional projection machine with the field reversed and lighted with a carbon arc was used. Any variations between the projected shape and the large layout were scaled and reduced mathematically in terms of the enlarged size. The reduced values then would show whether the cutter or hob was within prescribed tolerances.

At first only simpler forms were checked with projection equipment. However, as experience was gained, special fixtures and techniques were developed so that more complicated forms, including spiral angles and helixes, could also be checked. More projectors were added as additional uses were found for the method. Later, after about ten years of use, the carbon-arc lighted units were replaced with units having special lenses and 500-watt lamps.

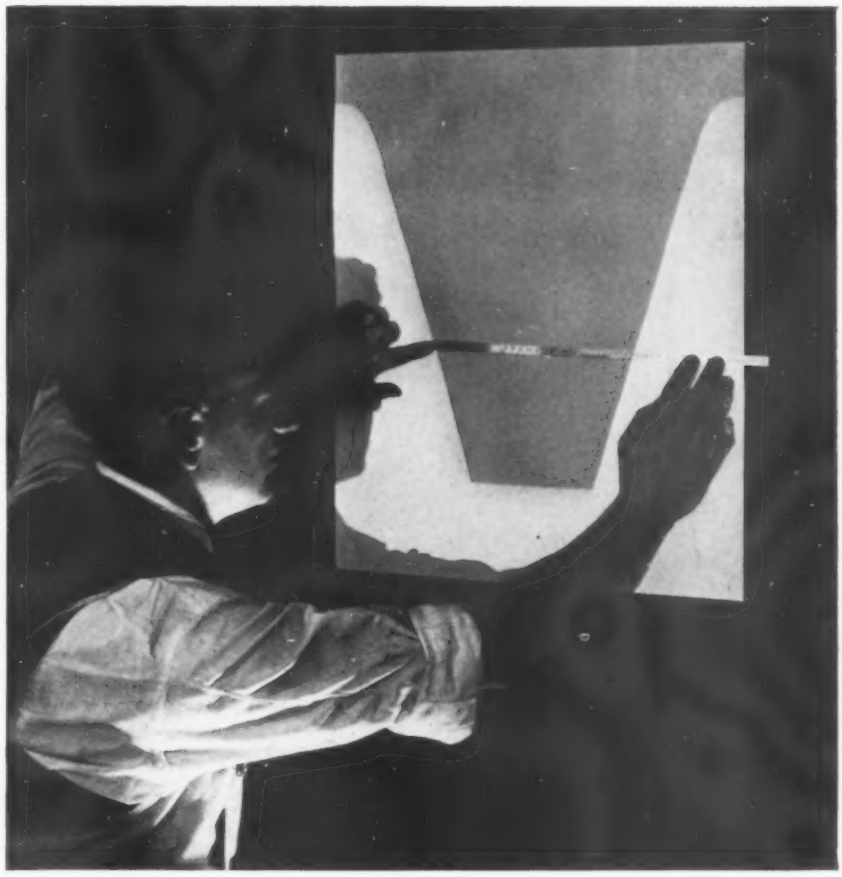
Good Lighting Aids Inspection

Today, the projection inspection equipment in the small tool division is set up in a specially constructed room operated in conjunction with the tool development, form tool grinding, and hob and cutter production grinding departments. The projection equipment includes fourteen screen type and six hood type projection machines. These units are placed in line along one side of a room 85-ft. long. Along the opposite side are hung fourteen black painted panels on which the screen-type units are focused. On these panels are mounted carefully drawn layouts against which the projected shadows are checked.

Above the projection machines are suspended a line of 100-watt lighting fixtures to provide necessary illumination for the proper operation of the units. The walls of the room are painted a light shade of green, and venetian blinds are fitted over all windows. The result is a soft even light in the room during the daytime. Shadows projected 18-ft. across the room to the screens stand out sharp and clear in this light. To provide the same quality of lighting at night, a row of 40-watt lamps is suspended above and somewhat in front of the viewing screens.

To avoid confusion, all of the screen

Speedier production and more accurate duplication are made possible by projecting tool forms against 50× drawings. Tolerances are held exactly on repeat orders and a working guide is provided while grinding is in progress



The form of a hob tooth is checked against a layout which is 50 times size. Consistent results are a major advantage obtained when using projection inspection equipment

type projectors are provided with lenses which throw 50x images on the screens 18-ft. away. Lenses with other enlargement ratios are available, however, for out-of-the-ordinary inspection problems. The layout drawings, against which the projected shadows are checked, are carefully made to a 50x scale and the lines are drawn as fine and sharp as possible. Forms and dimensions are checked by bringing the projected shadow against the line, never to the center of the line.

A major problem has been the selection of a drawing paper having low expansion or contraction with changes in humidity and temperature. A stable paper is necessary if consistent results are to be obtained. Various types and weights of paper have been tried, as well as drawings on glass and metal sheets. So far, the best results have been obtained when the form section outlines are drawn with fine lines on a flat sheet of fairly heavy white manila drawing paper like the "Hawk" paper supplied by Keuffel & Esser Company. Atmospheric and shop conditions in another plant possibly would make some other paper more suitable. Three sheet sizes, 8½x11 in., 12x18 in. and 19x24 in., have been selected as standard. These sheets are always stored flat; they never are folded or rolled for filing. While the accuracy of the shadow is the same over the entire area of the 32x32-in. screens, it has been found best to keep the checking lines as close as possible to the center of the sheet, and to mount this sheet at the center of the screen.

All Tool Shapes Can Be Checked

As only a small portion of the form on a cutter is checked at a given setting of the projector table, each drawing consists of a series of disconnected lines. When shifting the shadow from one of these lines to the next, a checking point on the first line must match a checking point on the next line if the set-up has been made properly and the drawing is correct. A table is lettered on each of the inspection drawings to show the vertical and horizontal distances the work table on the projector must be moved.

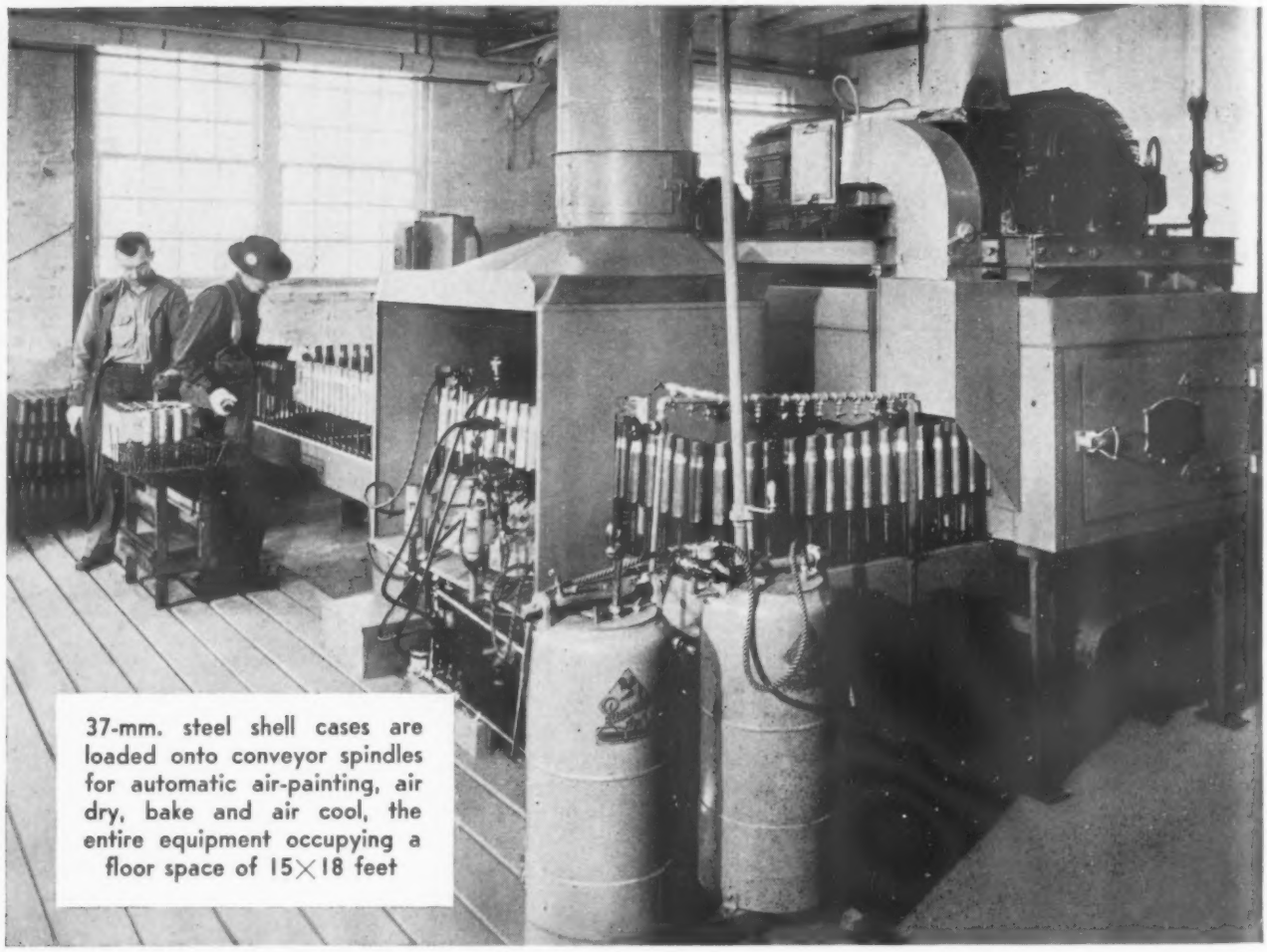
The procedure developed by Barber-Colman is unique because of its many applications. It is possible to check any kind of a form required, whether made up of straight lines, angles, radii or curves. Furthermore, a tool can be inspected in a fraction of the time required by the trial-and-error method of checking against templets.

Another important function of the projection room is to check hobs and other form cutters before hardening and grinding. As a result, these tools come to the grinding room in better condition than when the templet method was used. Projection also saves time by serving as a working guide as grinding progresses—inspection by projection shows the location and amount of stock that must be removed. It is necessary for the grinder only to remove the arbor with the workpiece from the machine and take it to the projection room without disturbing the position of the work on the arbor. This is very important if grinding must be continued after checking, because the grinding operation must be picked up in the same position in order to maintain accuracy.

Equally important is the ability to repeat tolerances, thus assuring the customer that he will always get cutters of the same accuracy. It is no longer necessary to try out each individual hob or cutter. The first cutter made is used to cut a sample on a precision machine. If this sample is correct we can proceed to make the rest of the tools, checking them by projection against a layout which fits the sample cut with the first tool. It is estimated that on an order of six hobs, at least three hours are saved.

Precision Coating of Shell Cases

BY R. H. SMUTZER, PAASCHE AIRBRUSH COMPANY



37-mm. steel shell cases are loaded onto conveyor spindles for automatic air-painting, air dry, bake and air cool, the entire equipment occupying a floor space of 15×18 feet

"Save the surface and you save all" is realized in manufacture of steel shell cases by automatic spraying equipment that can apply an extremely thin but flawless coating of phenolic varnish

PROTECTION against corrosion has been one of the difficult problems surmounted in successful development of the steel shell case. As a mass-production proposition, involving procurement of 20 to 105 mm. steel shell cases by the tens of millions, it was impractical to specify metallic protective coatings because of metal-supply, equipment and cost factors. Hence, Ordnance turned to the high-quality phenolic varnishes. Fortunately Amer- ...pliers in this field have been able to supply finishes that give steel shell cases adequate protection against exceptionally severe chemical and abrasive action.

Performance requirements indicate the quality standards set up for these finishes. As applied to the interior of the shell case, the phenolic varnish must not deteriorate upon lengthy contact with the corrosive charge nor soften under the intense, sudden heat of the explosion and the extremely solvent action of burning powder. As applied to the exterior of the case, the finish must resist both abrasive action from rough handling and corrosion from salt spray, moisture, mild caustics and oil. Moreover the varnish must be sufficiently elastic to permit crimping the mouth of the case onto the projectile.

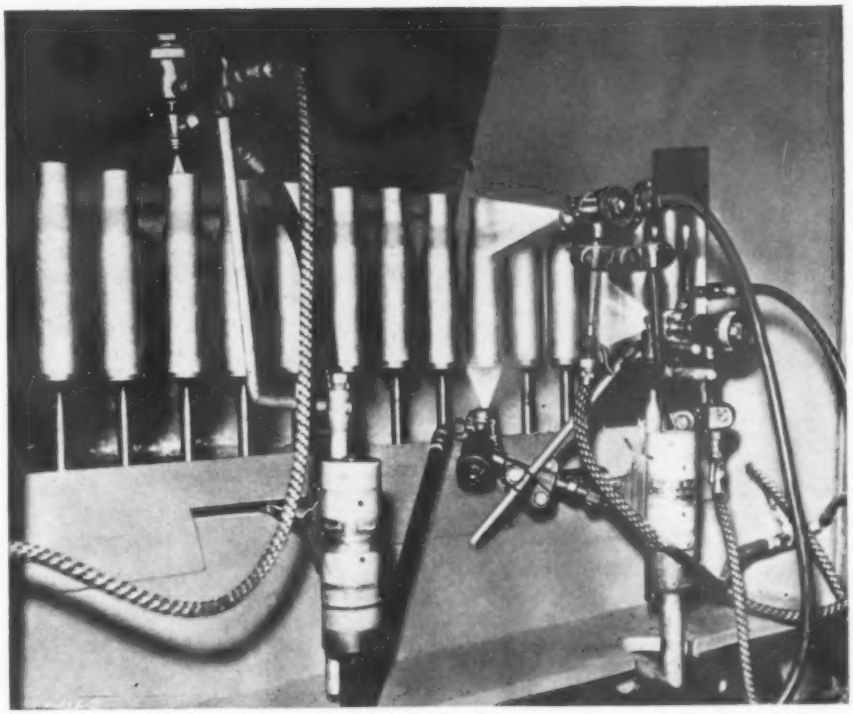
Specifications for air painting steel shell cases are likewise severe. Ordnance limits the film thickness to 0.0006 in., plus or minus 0.0001 in., and the coating must be as flawless

at the bottom of the cavity as on the outside surfaces. Here then is a precision coating job for automatic air-painting equipment.

Basic requirements of such a machine are: (1) air brush settings must be maintained as well as air and fluid pressures, and (2) the mechanism must register the spray guns with the work for closely timed intervals as the shell cases move past on a conveyor. The first condition has been met by development of air brushes with micrometer needle controls that can be locked at predetermined calibrations once the air regulators governing the air and fluid pressures are set. The second requirement is embodied in the cycling of the automatic machine which occupies a floorspace of 15×18 ft. and has 350 spindle assemblies set at 3-in. centers on the conveyor.

Shell cases are brought to the painting machine in wire baskets after cleaning and rust-proofing. They are loaded onto conveyor fixtures that extend into the primer hole to support the workpieces in the vertical position. Spraying is accomplished at two stations.

At the first station, a single, vertically mounted gun coats the interior; at the second station, three guns spray the exterior. Both the "interior" and "exterior" guns are mounted on oscillating arms that follow the work while spraying. Moreover the shell cases are rotated during both operations by a spindle driving unit of special design.



Work spindles rotate, gun arms oscillate to follow the steel shell case being sprayed. The first "station" at left coats the interior; the second station at right combines three guns for spraying the mouth, body and bottom

After spraying, coated shell cases move along the conveyor for a short air dry and then enter a gas-fired oven for baking at 400 F. for 20 min. Upon emergence from the oven the cases continue upon the conveyor for a 3-min. cooling cycle and are then removed for coating the primer hole and inspection. Proof of the efficiency of this method of spray painting shell cases to exacting Ordnance standards is seen in the fact that 998 out of every 1,000 pieces pass inspection.

Cutting Tomorrow's Corners

The distribution of low-voltage power—600 volts and less—has been materially improved by a power run with rows of power outlets for literally plugging in machine tools and other equipment. This simplifies the moving of equipment, and facilitates its re-arrangement to meet quick changes in production schedules. Such changes formerly required the moving of panel boards and other connections. Now a machine tool can be moved like a house floor lamp, at least as far as the electrical connections are concerned. Its cord is taken with it and plugged into the outlet nearest its new location.

✦

One result of the war demand for machine tools has been the abandonment of the deluxe finish for machine castings. Instead of spending hours on filling out imperfections and treating the castings to several coats of high-class enamel, they are simply snagged, sanded and then sprayed with a sort of crackle finish that hides defects normally emphasized by enamel. But one feature which jars those who really want to save metal is use of brass tags which apologize for the finish.

✦

A final nitrided case for taps, reamers, toolbits, rifling cutters and other small tools is doubling and tripling tool life in quantity production. After hardening and grinding, the tools are cased to a depth of 0.001–0.002 in. Nitriding temperature is customarily in the range of 1,050–1,150 F., with the treatment running from 10 to 60 minutes.

✦

War production demands have almost doubled the number of approved apprentice programs in the past 12 months. Since October, 1941, the Federal Committee on Apprenticeship has authorized about 2,000 such programs. Of these, 1,086 meet specific training requirements in war plants and essential civilian industries. The remaining cover training of apprentices in a recognized craft within a city of other specific geographical area.

✦

The American Standards Association now has over 1,700 members. More and more industrial concerns are finding that standardization of production equipment and manufactured material really pays. Last year 69 companies were added to the membership roll.

✦

Wood is replacing metals needed for guns, tanks, ammunition and planes as the automobile industry adopts it as a substitute for steel in truck bodies. This substitution saves 275,000 tons of steel annually—enough to build 30 large cargo ships.

Precautions To Be Followed

Proper machining practices prevent distortion and make the fire hazard associated with magnesium negligible. The fire hazard with grinding and polishing work can be controlled by using adequate dust-collecting systems

BY A. M. LENNIE, DOW CHEMICAL COMPANY

DISTORTION of magnesium parts during machining occurs infrequently. But when it does occur, it can usually be attributed to heating of the part or to improper chucking.

Heating of the work is increased by dull or improperly designed tools, as well as by taking fine cuts. Heavy cuts carry off most of the heat in the chips, and actually cause less machining heat due to less working of the metal. The use of sharp, correctly designed cutting tools and increasing the feed and depth of cut, except on light parts, usually corrects excessive distortion caused by thermal expansion. The use of an adequate quantity of cutting oil, as discussed previously, will help to correct such a condition.

How to Eliminate Distortion

Magnesium alloys have a low modulus of elasticity; consequently, they "spring" more easily than most metals. Therefore, it is important to avoid high clamping pressures when chucking magnesium work, especially parts with thin sections. Heavy cuts will also cause light parts to distort.

Distortion due to stresses induced in fabrication or casting occurs infrequently and may easily be eliminated by heating the part at 500 F. for approximately two hours, or at a lower temperature for a longer period followed by slow cooling. Magnesium alloy parts which are solution heat-treated or aged will not exhibit this type of distortion because such stresses are relieved during heat-treatment.

If distortion is noted after roughing cuts, even if all stresses have been removed previously, the size of the cuts should be decreased inasmuch as the heavy cutting pressures may be inducing machining stresses. In such a case, the cutting tools should be inspected, since dull or incorrectly designed tools will also promote such a condition. Parts may be rought machined and then stress relieved before finishing; however, this procedure is usually necessary when following proper practice.

Grinding and Polishing

The relative softness of magnesium requires the use of medium-hard grinding wheels with medium to coarse abrasive grits. A grain size of 20 to 70, an open structure of 4 to 8, and a vitrified or resinoid bond function satisfactorily. Snagging and foundry clean-up work require very coarse wheels, such as 20 grain, to avoid loading of the wheels and to provide rapid free cutting. Either silicon-carbide or aluminum-oxide wheels, conforming to the above specifications, can be used. These recommendations are intended only as a general guide, and before setting up a production job, the grinding wheel supplier should be consulted.

Magnesium ordinarily should be ground dry, but in special cases, such as surface grinding where a fine finish is desired, wet grinding can be employed, using a low-viscosity mineral oil as the cutting fluid. Under any circumstances precautions must be taken to insure that proper dust-collection equipment, as discussed later, is used.

In wet grinding a generous amount of oil should be used to insure complete quenching of the dust and effect complete removal to a sludge-collecting bin. The dust sludge should be kept thoroughly wetted with oil to reduce the fire hazard. Machines should be cleaned out frequently to prevent large accumulations of magnesium dust—the sludge should be burned or buried after mixing with five parts of sand.

Surface irregularities are readily removed from magnesium parts by polishing and buffing operations, the choice of which is dependent upon the desired quality of the finish. High luster surfaces for articles to be plated or used for decorative purposes can be produced by appropriate buffing. Table 6 presents typical procedures for polishing magnesium. Each successive step in this table produces a finer finish. These polishing directions can only be of a general nature since the requirements of individual jobs vary widely.

Dust Collection

Grinding and polishing of magnesium produces highly inflammable dust which in the proper proportions with air can ignite with explosive violence. Therefore, it is essential that this dust be immediately removed from the working area, that it be prevented from forming explosive mixtures, and that it be disposed of safely. This can be done effectively with a dust-collecting system of the proper design.

A system considered safe is one in which the dust is precipitated by a heavy spray of water or low-viscosity mineral oil to form a sludge. The equipment must be designed to prevent the accumulation of dust or sludge in any location where it could dry out to an inflammable composition. Periodic inspections should be made of the collecting systems to insure against such conditions.

The best collectors for grinding stands are small units which service one or two stands and have the power supply for the grinder, water circulation and air blower for the collector in-

terconnected so that the grinders cannot operate without having the collector in operation. This type of collector is shown in Fig. 15. The grinders should be connected to the collector by short straight ducts.

Disposal of Dust

A central dust-collection system that services a large number of grinding hoods or stands can be operated safely if the dust is precipitated by heavy sprays at each hood or stand. The dust is conveyed to a central settling tank from which it is removed. If dust or sludge does not accumulate in the ducts, such a system will be safe. As in the smaller unit systems, the power for the grinders, air blower and liquid circulation should be interconnected.

Sludge pits should be adequately ventilated. The sludge which collects under the liquid in the pit should be removed frequently. This sludge mixture can be disposed of by spreading in thin layers and burning, or by mixing the accumulation with five parts of sand and burying it.

The same principle of dust collection can be applied to grinding and polishing booths where the work is done on a grating. The flow of air in the hood is past the work through the grating and through a liquid spray which removes the dust. Fig. 16 shows this type of collector. The hoods or booths should be designed to catch as much of the dust as possible, keeping it off the floor, ledges and pipes in the shop, and workmen's clothes.

For small or intermittent work, a simple dust collector like the one shown in Fig. 17 can be used. The hood around the individual grinding wheel causes the dust particles to impinge on a pool of oil in a pan below the wheel. The dust sinks rapidly below the surface of the oil, forming a non-hazardous sludge. Due to the lack of suction, a small part of the dust will escape from the hood—this dust must not be allowed to accumulate, but should be swept up periodically and disposed of safely.

Central collecting systems in which the dust is passed through long dry or partly dry ducts, and conventional dry-type filter collectors, are dangerous and definitely not recommended for the collection of magnesium dust. Accident records for systems of these types have proved them to be very hazardous.

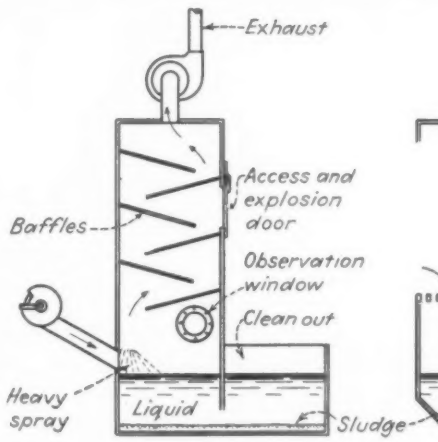


Fig.15
Dust collector for grinding wheel stands

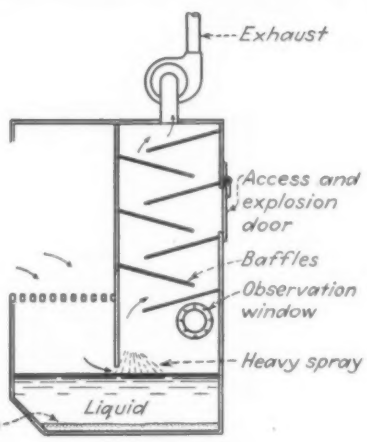


Fig.16
Dust collector for grinding and polishing booths

Note :- Interconnect power lines to wheel, air-blower and liquid-circulation motors

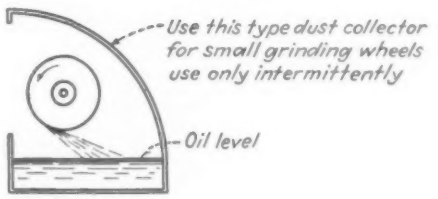


Fig.17

A safe dust-collection system for grinding and polishing operations on magnesium is one where a heavy spray of water or low-viscosity mineral oil precipitates the dust into a sludge. The equipment must be designed to prevent the accumulation of dust or sludge in any location where it could dry out to an inflammable composition

Safety Recommendations

In addition to the precautions already mentioned, the following important items must be observed:

1. Grinding of other metals on on equipment being used for magnesium is dangerous because of the possibility of producing sparks. Mark grinding equipment "FOR MAGNESIUM ONLY." This rule should be followed rigorously.

2. The grinding of magnesium surfaces which have been chrome-pickled will cause sparks. Special precautions should be taken to insure against accumulations of dust or explosive air-dust concentrations within range of the sparks.

3. Operators of grinding equipment must avoid coarse-textured or fuzzy clothing. Leather or smooth fire-retardant clothing should be worn and brushed frequently. Clear lanes to conveniently located fire showers should be provided.

4. The accumulation of magnesium dust on benches, floors, window ledges, overhead beams and pipes, and similar places should be avoided. Good housekeeping is essential in the safe grinding of magnesium. Vacuum cleaners should not be used to collect the dust. It should be swept up and place in covered iron containers plainly labeled, and should not be mixed with regular floor sweepings. Dust should be disposed of by burning in small quantities on a metal surface, or by burying after mixing with five parts of sand.

5. Adequate warning signs should be displayed prominently inside and outside of the grinding rooms. These signs should warn against the use of water on fires, and should recommend the use of a satisfactory extinguisher.

6. An adequate supply of extinguishing compound should be available near each grinding both. It should be kept in covered iron containers plainly labeled.

Fire Prevention

When using proper machining practices as recommended in this series of articles, the fire hazard associated with magnesium alloys is negligible. These alloys must be heated to their melting points before they will ignite.

Roughing cuts and medium finishing cuts form chips of such a size that they are not readily ignited during machining. Fine finishing cuts however produce chips which will ignite at high

Table 6—RECOMMENDATIONS FOR POLISHING MAGNESIUM

Operation	Abrasive	Wheel: Type	Wheel: Dia., in.	Surface speed, ft. per min.	Remarks
Rough polish...	60 to 100 grit	Canvas, sheep skin or felt	6 to 12	5,000– 6,000	Required only for rough surfaces, such as sand castings. Grease stick may be used.
Medium polish..	100 to 200 grit	Built-up cloth	6 to 12	5,000– 6,000	Grease stick may be used
Dry fine polish..	Dry compound or Lea compound, grade L or C	Loosely sewed buff	6 to 12	5,000– 6,000	.....
Buffing	Tripoli	Loosely sewed buff; 74 to 82 count cloth	10 to 14	6,000– 8,000	.....
Coloring.....	Dry lime	Canton flannel buffs	12 to 16	8,000–12,000	Minimum pressure to produce best luster.

cutting speeds. Stopping the feed and letting the tool "dwell" will produce these extremely fine chips. Major factors tending to increase the fire hazard are fine feeds, dull and chipped tools, improperly designed tools, and poor machining technique. It has been shown that with sharp cutting tools it is necessary to use a feed of less than 0.001 in. and a cutting speed in excess of 1,000 surface ft. per min. to create a serious fire hazard. Even under the most adverse conditions, that is, with dull tools and fine feeds, the fire hazard is very slight below 500 surface ft. per min.

Sand cast surfaces, oxide inclusions and ferrous inserts which cause sparks when hit by the cutting tool increase the possibility of fire. The use of a sufficient quantity of low-viscosity mineral-oil cutting fluid will practically eliminate any possibility of fire when machining magnesium at any cutting speed. If a particular job prohibits the use of a cutting fluid, cutting speeds should be reduced to below 500 surface ft. per min., and the recommendations regarding sharp tools and cutting feeds rigorously followed. In all machining operations where a low cutting speed is used, magnesium may be safely machined without a cutting fluid, but safe practice dictates that where high cutting speeds are used a cutting fluid is necessary.

In addition to the recommendations regarding the actual machining of magnesium, the following cautions should be observed to minimize the fire hazard:

1. Magnesium chips and dust should not be allowed to accumulate on the machine or clothing of the operator. They should be removed at frequent intervals and stored in plainly labeled covered metal cans.

2. Machines and adjacent floor areas should be kept reasonably clean.

3. An adequate supply of recommended fire extinguishers should be within reach of the operator.

4. No smoking should be allowed in the vicinity of magnesium machining operations.

5. Keep open flames and sparks away from finely divided magnesium at all times. Welders should be warned of this hazard.

If a magnesium fire starts, it may readily be extinguished by carrying out the following precautions:

1. Have an adequate supply of recommended fire extingushers near each machine where they can be obtained quickly by the operator. Several proprietary compounds are available which will successfully extinguish chip fires such as would be encountered on a machine tool. The following materials are recommended for this use:

G-1 powder—Pyrene Manufacturing Company
Cast-iron borings
Graphite powder
Granulated coal-tar pitches

2. An adequate amount of the materials listed in (1), enough to cover the fire with a layer approximately ½ in. deep, should be sprinkled over the burning magnesium. If there is excessive smoking in spots, more extinguishers should be added to each spot. These instructions can be applied generally to all powdered or granulated extinguishers, but detailed instructions as given by the manufacturer should be followed.

3. Active fires on combustible surfaces should be covered with extinguisher and the whole mass shoveled into an iron container.

4. Do not use water or any of the standard liquid or foam-type extinguishers, since they will intensify the fire and may cause an explosion. Sand, talc, asbestos, aplite and similar materials will also accelerate hot magnesium fires.

5. Operators should be instructed in the proper procedure for extinguishing magnesium fires, preferably by means of demonstrations. Signs which call attention to the fire hazard and outline extinguishing procedure should be displayed prominently.

Engineers in Uniform

TOO MANY SHOP MEN get the idea that men in uniform know little or nothing about shop work. Some of the best production engineers in the country are in uniform. When the shop man gets the idea he is putting something over because the visitor is an officer, he is likely to be greatly, and often embarrassingly, mistaken.

Many officers of comparatively low rank have been production managers of large plants of various kinds. They know more about production than many civilians who are running some of our war industries. War production can be greatly increased by heeding the suggestions of these engineers in uniform.

Welded Forming Dies Made from Steel Plate Replace Castings*

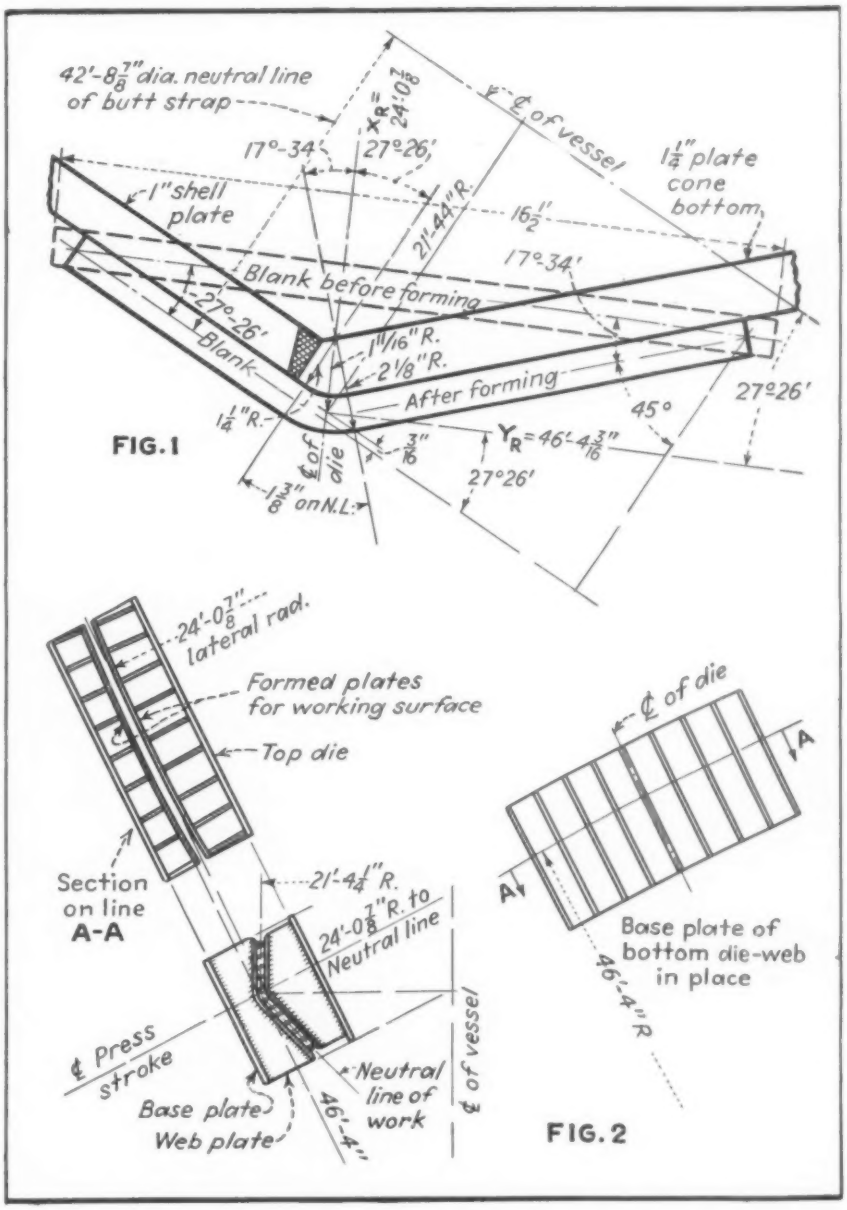
BY WALTER E. KLAUBERG

Increased casting costs and slow deliveries now make it profitable to fabricate dies having two or more curves each in a different plane. A typical layout is given here

LARGE ONE-CURVE dishing or forming dies of arc-welded plate can generally be made more economically than those of cast iron. Under present conditions, with increased casting costs and delayed deliveries, it has been desirable to fabricate more complicated dies from steel plate. One such die might be one with a gore shaped to a different curve in each of three planes. This was adopted for a reinforcing ring for a pressure vessel 42 ft. 6 in. in diameter having a 45-deg. cone bottom butt welded to the cylindrical shell. The ring, made of $\frac{7}{8}$-in. steel plate and used to reinforce the butt weld, was formed to extend $5\frac{3}{4}$ in. up the cylindrical shell and $9\frac{1}{2}$ in. down the cone bottom, and running entirely around the vessel.

The general procedure for planning a die with a different curve in each of three planes, as required for the reinforcing ring, is to lay out a vertical section through the part to be formed, and then divide the angle or curve, as the case may be, in such a way that the bending or curving will be evenly proportioned on either side of this dividing line. The dividing line becomes the center line of the die working surface and indicates the direction of the press stroke. The general layout for the reinforcing ring in question, embodying the stated principles, is shown in Fig. 1. The position of the die in the press, showing the center line of the press stroke, is illustrated in Fig. 2. Since the dividing line is in line with the press stroke, the base of the die will be established in a plane perpendicular to the line and at such a distance from the work as to allow sufficient depth of the die webs for strength and for clearance between the press bed and the curved ends of the work as it passes through the dies.

The die work surface is supported by a series of webs extending radially in



This layout was used to make the die for forming a reinforcing ring on a 42½-ft. diameter pressure vessel. The die-work surface is supported by a series of webs of light plate. Space between webs is filled with concrete

* Data and illustrations in this article are from a study submitted to the James F. Lincoln Arc Welding Foundation by Walter E. Klauberg, design engineer, Wyatt Metal & Boiler Works, Houston, Texas, in its recent $200,000 Industrial Progress Award Program for reports, advances and improvements made by the applications of arc welding in design, fabrication, construction and maintenance.

the plan view. The plan view may be projected from the side elevation, as shown in Fig. 2, which is the starting point in the layout. The sectional view on the curved center line of the plan shows the lateral radius of the die. By arranging the direction of each web in section *A-A* normal to the lateral curve, the shape of the working surface of the webs will be identical—the variation in depth is calculated and the dimensions given on shop working drawings. After the webs are all cut out for both top and bottom dies and spaced on their respective base plates, as shown in Fig. 2, they are welded in position. The plates can then be pressed to form the working surface of the dies.

Webs Filled With Concrete

The plates for the working surface are laid out in the flat to the same shape as the blanks for the reinforcing ring segments, and are formed by first rolling to the lateral radius shown in section *A-A* of Fig. 2, and then by pressing between the webs of the top and bottom die. During the pressing, the working surface plates are moved after each press stroke until all parts of the surface have been pressed directly between opposing webs of the top and bottom dies and the shape is even and true. Then they are strength welded in place to the webs.

Comparatively light plate is used in this type of die and the space between webs is filled with concrete. This makes an economical, yet strong and durable forming die; also, it allows for the concentrated loads that result when shim plates are used during the pressing operations to iron out wrinkles in the work. The use of concrete fill overcomes the only advantage cast-iron dies has over those fabricated by welding from steel plate—a solid surface free from spring.

Fabricated construction decreases the weight of steel required for these large forming dies. Castings for the dies described averaged 12 cents a pound during 1942, and since each die would weigh 1,400 lb., the cost if castings had been used would have totaled $168. The table shows that the welded die cost but $72.90 representing a saving of $95.10 over the cast die, which is (95.10/168)100 or 56.7 percent saving on each die. Since the total cost of cast dies in our plant averages $1,610 annually, we would save 0.567x 1,610 or $912.87 each year by fabricating the dies from steel plate.

COMPARATIVE DIE COSTS

Cost of cast-iron die complete		$168.00
Cost of welded die:		
730 lb. of ½-in. steel plate at 3 cents per lb.	$21.90	
20 lb. of Fleetweld electrodes at 7½ cents per lb.	1.50	
4½ cu. ft. of concrete at 33⅓ cents per cu. ft.	1.50	
Labor, including cutting, fitting, welding and pouring concrete	48.00	
Total cost of welded die		72.90
Saving effected by welded construction		$95.10
Percentage saving = (95.10/168)100		56.70%
Annual cost of cast-iron dies in writer's plant		$1,610.00
Annual saving by using welded dies		$912.87

Recruiting Skilled Workers

BY EDWARD R. PROSSER, AMERICAN BANTAM CAR COMPANY

AS MORE AND MORE trained workers were called into the armed services, officials of the American Bantam Car Company had to find suitable persons to fill vacancies. The company's location in a small mid-western Pennsylvania city, where skilled help of the type required on close tolerance work is at a premium, further aggravated the situation.

Company executives, in cooperation with the United States Employment Service, the National Youth Administration, Pennsylvania State College and the local school authorities, worked out a solution which is proving highly successful. The company furnished the instructor for night courses, held in local high school class rooms twice weekly and attended by students recruited by USES.

After the local office of the USES had recruited possible candidates for the course, they were interviewed by the factory manager, to select those who seemed most likely to be able to take and assimilate the intensive course of training.

Classes were conducted twice each week, for four hours each, over a period of fifteen weeks. Many students were placed in daytime jobs in the plant while still taking their training. The students' only expense was that of textbooks and supplies. New classes, started at regular intervals, and predicated on available personnel.

Another opportunity for training was found at South Park, near Pittsburgh, where there is located a National Youth Administration center of the residence type that had been developed for training boys in industrial practices. Since the advent of the 18 and 19 year old draft law, this center has been converting its facilities to the training of young women.

The center contains fully equipped shops of all kinds, including radio shop, tin shop, welding shop, pattern shop, machine shop and foundry where students learn by actual use of the equipment. It also is provided with residences for students, recreational facilities, commissary and a completely equipped hospital for medical and dental care.

The N.Y.A. officials cooperated in explaining and making available the South Park facilities. The local USES offices recruited young women interested in taking this training, and at the present time about thirty young women from this area are in residence at the South Park center.

Satisfactory completion of either of these courses entitled students to an opportunity for employment at the American Bantam Car Company.

These courses have already begun to illustrate their value and will continue to prove more valuable as time goes on and vacancies are filled with operators who have been given just the right training.

Auxiliary Scrap Hunt Yields 13,000,000 Pounds in Four Months

BY H. O. WATJEN, SUPERVISOR OF SALVAGE, PITTSFIELD WORKS, GENERAL ELECTRIC CO.

THE INDUSTRIAL SALVAGE SECTION of the Office of Production Management in January requested all industries to develop salvage programs and to keep these programs active. In response to this request, the General Electric Company at all of its plants immediately put programs into effect to bring to light and get back into production all dormant materials. This of course is in addition to the regular operations already in effect of collecting, sorting, and shipping current scrap amounting to 340 million pounds in 1941. This represented 5,000 carloads.

For the first four months of the campaign, 13 million pounds of dormant scrap were collected from all General Electric plants and shipped back to the mills. Of this amount, 90 percent was steel and cast iron, the remainder non-ferrous material, rubber, etc. These campaigns in the different General Electric plants have not been allowed to die but have been kept alive and active and we anticipate that the total *dormant* scrap collected for 1942 will amount to at least 20 million pounds.

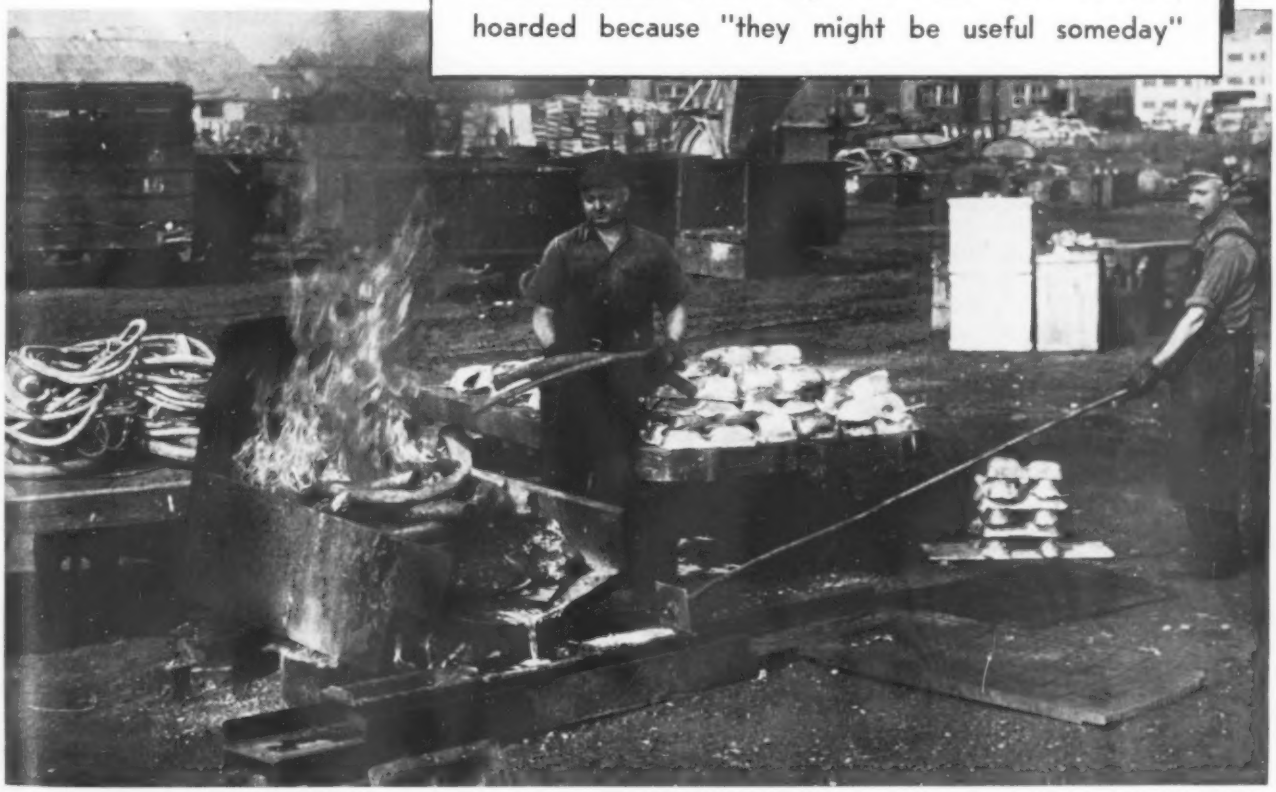
One individual was put in charge of salvage throughout all departments of this plant and acted as Chairman of the general campaign committee, consisting of five department heads familiar with the utilization of material and equipment.

Circulars given to each employee included statements by the plant and departmental managers asking their cooperation. A list of scarce materials was given, along with pertinent instructions for their conservation.

During the first month of the campaign in this one plant, 1,094,000 pounds of dormant scrap were collected and shipped to the steel mills, foundries, and smelters. This campaign has since been steadily continued and brought to the attention of all employees through weekly issues of the plant paper. The total amount of dormant material of this plant reclaimed in the past eight months is 3 million pounds of steel and iron and 195,000 pounds of non-ferrous metals. Many pieces of equipment and material have been put into active use.

Although a great deal of the material

Though it has conducted a successful scrap elimination program since 1918, General Electric had great success with a special drive to get out tools and materials, hoarded because "they might be useful someday"



"We are putting into effect a plan to search out all idle material that can possibly be reclaimed, whether it is underground, overhead, or in our buildings or yards. The plant is being divided into districts, to each of which a monitor is appointed to inspect his area thoroughly for all idle materials such as the following:

MATERIAL

A. Scrap or obsolete material on floors, in stockrooms or yards, or under benches.
B. Slow moving material on floors or in stockrooms.

EQUIPMENT

A. Equipment not being utilized.

TOOLS

A. Obsolete or slow moving dies.
B. Obsolete or slow moving jigs or fixtures.
C. Broken or worn drills, taps, reamers, etc.

PIPING

A. Dead pipe lines (gas, air, water, steam)
B. Dead electrical lines still on ceiling or underground.

PATTERNS

A. Obsolete or slow moving.

"To make this campaign a success and to provide needed material for our Army and Navy needs, every employee in the plant is asked to assist by searching out any materials lying around and not being utilized.

"On, under, and behind work benches there is a considerable amount of material which should be scrapped. Any employee who notices material which he thinks can be scrapped should call it to the attention of his foreman or the special monitor appointed in his department."

brought out in this campaign resulted from removing dormant material on floors, in stockrooms and yards, or under benches, much was uncovered through unusual means.

For example, due to the changes in power distribution centers in the plant, a great deal of lead-covered cable was not in use and was allowed to lie dormant in the underground duct because of the expense involved in removing it. Under the present material shortage conditions, the cables were removed, and 38 tons of lead and copper salvaged from them. These cables were carefully inspected upon removal and those in usable condition sealed and used as replacements.

Reclaimed material is returned to the salvage department where it is carefully sorted into the different kinds and classifications. It is then processed by means of torches, shears, and baling presses into shapes and sizes which can be utilized by the mill.

General Electric's routine salvage program had its inception in March, 1918, when representatives of the salvage departments of the various plants were called together to formulate plans for developing better material utilization. Prior thereto, investigation of material utilization had been made spasmodically if some unusual condition brought the scrap into prominence. As a result of this meeting, definite plans were made to see that material utilization was improved and the classifications and conditions of scrap materials bettered for maximum value.

A representative plan described below was carried out successfully at one of the General Electric plants.

(1) The first fundamental in controlling waste material losses was to determine the amount and kind of scrap produced in each department. This was accomplished by having all waste materials returned to the salvage department accompanied by a tag indicating the nature of the material, the weight, and the department which produced it. Tabulations were made of the amount of each type of waste produced in each department over a short period of time. This gave an index of where the greatest waste loss occurred so an investigation of these departments could be made and measures taken to see what could be done to improve conditions.

(2) Accumulations of waste materials as received in the salvage department were inspected as to their condition; particular emphasis was paid to non-ferrous materials as a loss of several cents per pound is incurred by mixing. By going back into the shop where these wastes were produced, as for example, in the case of brass turnings, close co-operation with the machining department resulted in being able to obtain these turnings free from oil and contamination. It was, therefore, unnecessary to use even a magnetic separator and the brass turnings are sold as Grade A clean turnings. This practice was followed in other manufacturing sections to see that segregations were made and the scrap kept clean.

(3) After determining the departments where the major loss in scrap occurred and after arranging for it to be kept segregated and clean, the next step was to study the waste as produced at the machine and devise means of reducing the amount of scrap, both in dollars and in pounds. In some cases, the design of the part was taken up with the engineer and changes were made which would reduce the amount of scrap necessarily produced. In other cases, screw machine parts were changed to header parts, practically eliminating the waste.

In the punching of brass and steel parts, multiple dies were introduced; for example, double dies replaced single dies so that the same amount of punchings could be obtained from using a strip less than double the width of the strips required for two single dies. Where the quantity of one part alone did not warrant the cost of a double die, two similar punchings were produced from a combination die. This oftentimes amounted to a 15 or 20 percent reduction in gross material required.

In many cases it was found that designs could be changed to use less costly materials and at the same time furnish a product of as good or even better characteristics than the original.

(4) Having studied a department, bogeys were set up showing the ratio of waste produced related to the direct labor in the department. In addition, each foreman was given a monthly statement showing the pounds of waste, the first cost value, scrap value, and the loss in material value on each item of waste in his department. From this report, any unusual loss is brought to light, investigation made, and corrective measure applied.

The salvage department is the "watch dog" of the waste treasury. Exceptional waste or mixing of scrap is immediately taken up with the foreman of the producing department involved.

The salvage department is also alive to possibilities of improving the preparation and selling of scrap to obtain the maximum value of the scrap sold and minimize the loss in scrap value.

Food—The Deciding Issue

Our food problem remains to be solved

THE first thing the Germans did when they occupied Czecho-Slovakia, Poland, Belgium, France—was to empty all warehouses. Everything went into trucks headed for Germany.

The Nazis knew that this war would be won by the army that had the most supplies and the best supply system.

The Nazis knew that supplies are as essential as guns. They knew that the most essential of all supplies is . . . food.

Being the only people on earth who can watch women and children starve, the Nazis seized upon food as their most powerful instrument for disciplining the masses. They added famine to their arsenal of conquest.

The flocks and herds of Europe are being consumed with alarming rapidity. The desperate shortage of meats and fats is growing steadily worse. Our Allies are short of certain foods that we must supply if we expect them to carry on.

And as we supply them, as our imports are curtailed, as our fighting men consume more than they do in civil life, and as we fail to increase our production rapidly enough . . . we, too, become short of certain foods.

Former President Herbert Hoover, speaking before a conference of the Governors and Representatives of twelve Mid-Western farming states in Des Moines on March 15th, sounded the warning that American agriculture, beset by Washington bungling on manpower, farm machinery and price systems, strangling production and distribution, is facing a deterioration which may bring on a national food shortage such as led to the collapse of Russia, the defeat of Germany in the first World War and the fall of France in the present war. Unless this deterioration is stopped, warns Mr. Hoover, we cannot hope to win the present conflict.

Complications of similar magnitude face the food processor and the distributor.

Never in the history of the world has man's dependence on food been so crucial. Yet it is not easy for us to grasp the full significance of the crisis. We are so accustomed to finding milk, eggs and butter on our doorsteps every morning, we are so used to filling our pantries from the shelves of our grocers and markets that we accept food as something that is due us on demand. We do not stop to think that we never are more than a few meals ahead of famine.

But this picture has changed. Now we are faced with food rationing, and every day the shelves of our food markets become more bare.

* * *

Let it be noted that the appointment of two Food Administrators has not solved the food problem. It is still with us; daily it becomes more critical. Unless it is solved, and solved quickly, the very food that ex-Food Administrator Wickard said would "win the war and write the peace" may lose the war and lose the peace.

Put very simply and clearly, the food problem amounts to this: we are trying to feed upward of 200 million people. We are trying to do it with the farms and other facilities that heretofore have been capable of feeding about 145 million people (our present population plus a 5% surplus).

Had the Government foreseen the need and planned ahead, we could have begun by 1941 the enlargement of our farm production and food processing capacity. Two irreplaceable years have been lost!

The gravity of the situation becomes apparent when we consider that 50,000 factories are required to process our foods. Food processing not only is America's biggest industry—it is one of America's most important for, without processing, most foods would perish before they could reach the consumer. The term "processing" covers the salting, drying, smoking, pickling, chilling, canning, packing and other methods of preservation that make it possible for us to eat in 1943 food that was produced in 1942. Few realize that most of the food we shall eat in 1943 was produced and processed last year, that most of the seed we plant this spring will grow food for 1944 or perhaps later.

In one important process of preservation, tin and rubber are vital materials. When the Japs captured Malaya and the Netherlands East Indies more than half of the world's tin and nearly all of its rubber fell into their hands. This forced drastic changes upon our entire food economy. The importance of tinplated steel containers, tops for glass jars and rubber gaskets is fairly obvious . . . metal food containers alone consume, every year, more than 2,700,000 tons of steel.

The aggression of Japan has snared our whole food industry in a maze of intricate packing problems. It has enforced recognition of a new principle of food technology, i.e., that the *method* of food preservation is determined by the type of container available. The tin, steel and rubber stringency compels many food processors to adopt

unfamiliar methods – methods that call for a great deal of new equipment. This, in turn, involves the use of critical materials that are so urgently needed for other war purposes.

This conversion of the food processing industry to meet these exacting restrictions has been greatly complicated by two factors that have increased its wartime burden. Indeed, it is these that provide the principal reason for civilian food rationing.

The first of these is the task of feeding our armed forces overseas. Allied ships are being sunk at an alarming rate and the loss of cargo is considerable.

The second factor gravely augments the first. Under Lend-Lease our country is undertaking to feed our Allies to the extent of approximately 60 million people.

Types of food required for Lend-Lease and the armed forces are the finest we can produce. They are the high protein foods, especially meats, cheese and milk; and the protective foods which rate high in vitamin content. Peculiarly enough, the more valuable a food is from a nutritive angle, the more specialized is the processing required to preserve it.

The food processing industry, handicapped as it is, is meeting today's challenge with resourcefulness and enthusiasm . . . despite container complications and shipping shortages.

This is the tenth of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers, and in daily newspapers in New York, Chicago and Washington, D. C. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.

It is accomplishing its Herculean task by resurrecting and modernizing a method of food preservation that is as old as mankind. Probably you have read a great deal about dehydration. You actually may have eaten dehydrated food, but right now nearly every bit of dehydrated food is earmarked for the armed forces or for Lend-Lease.

Food processing never will be as spectacular as the production of bombers or tanks. But under today's conditions, the performance of the food processor is no less important . . . no less inspiring. When we consider that dehydrated food is compressed into solid blocks with a density nearly equal to that of coal, so that almost a whole meal can be carried in a vest pocket, and that half of the shipping space is thereby saved in transportation, we begin to appreciate what the processors have contributed to meet the food problem imposed by the war.

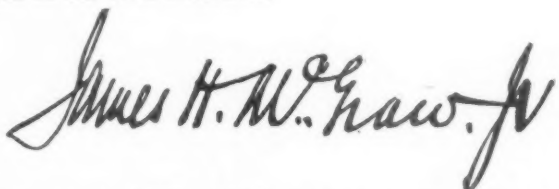
But they have not only contributed new methods, they are achieving new highs in production. And now they are asked to do what borders on the impossible. Consider dehydrated egg powder. Normal production in pre-war years was about 3,000,000 lbs. In 1940 this was increased two and one-half times, in 1942 it was stepped up again, this time forty-fold. And in 1943 the call is for another 60 per cent boost, to make a total of 480,000,000 lbs. Dried milk powder production of 350,000,000 lbs. in 1940 must be increased to 685,000,000 lbs. in 1943.

Vegetables, which were a small item to the processor before the war, now are dehydrated in enormous quantities. The vegetable dehydration industry has had to grow by leaps and bounds without benefit of the high priorities accorded to arms, ship and aircraft building. Production of dehydrated vegetables in 1942 was four times that of 1941, and 1943 calls for a sixteen-fold increase over 1942.

Total dehydrated food production in 1943 is scheduled at 1,750,000,000 lbs., dry basis . . . *all for export.* Multiply that by 10 and you have a rough approximation of the astronomical amount of raw materials that will have to be produced.

Many problems remain to be solved in the troublesome days that lie ahead. But with all his resourcefulness, man has little control over the weather. A severe drought could wipe out all of man's carefully laid plans. If we are tempted to reassure ourselves with the thought that the food situation probably is not so serious as it is painted, it will be well to remember that last year's crop increase over 1941 was due to better than average growing weather.

The war-bred food crisis that now confronts us will be met only by immediate measures to insure a food production ample to allow for adverse weather conditions. The food processing industry is capable, but has not been granted the needed help, in coping with its tasks. The food problem as a whole involves all three functions of production, processing and distribution. And if we are to master the problems that now beset us, all three of them must be coordinated under a single administrative control. "Food will win the war and write the peace". But if American food is to do that double job, we must develop a capacity for food *administration* comparable with the genius of our food industries.



President, McGraw-Hill Publishing Company, Inc.

War Winning SUGGESTIONS

The following ideas were selected from those recognized as meritorious by the Board for Individual Awards, War Production Drive. They are freely offered to industry as an aid to its war production.

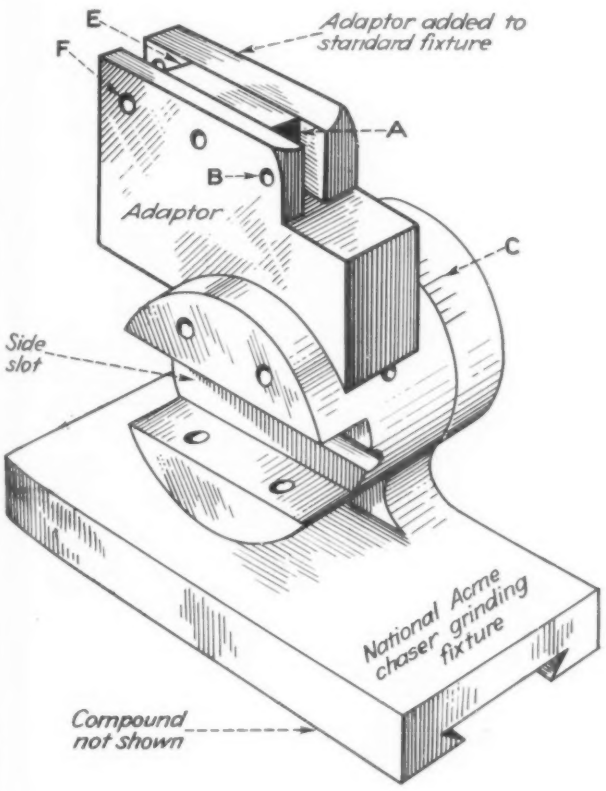
Improves Grinding of Tap Chasers

The illustrated holder, designed to supplement a standard National Acme chaser grinding fixture, speeds the grinding of tap chasers. Directions for grinding the lead on the chasers are as follows:

1. Place the chaser in slot *A*.
2. Tighten setscrew *B*.
3. Set the fixture at the proper angle by using scale *C*.
4. Determine the radius by setting the slide at the proper distance for the centerline of the compound.
5. Grind the chaser by swiveling it against the grinder.

Directions for grinding the lip are:

1. Mount the holder in the side slot of the grinding fixture.
2. Place the chaser in slot *E* of the holder.
3. Tighten setscrew *F*.



4. Set the compound at zero with the chaser holder facing the grinding wheel. Lock it in this position.
5. Set the grinding fixture at the proper angle, using graduated scale *C*.
6. Grind the lip by moving the grinder table back and forth under the grinding wheel.

This adaptor speeds the set-up for grinding the lead and lip of tap chasers, and insures accurate work. *Suggested by A. P. Zehr, International Harvester Company.*

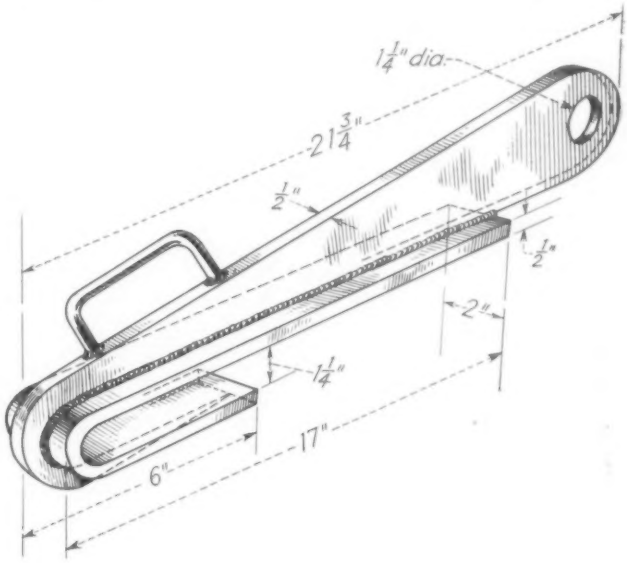
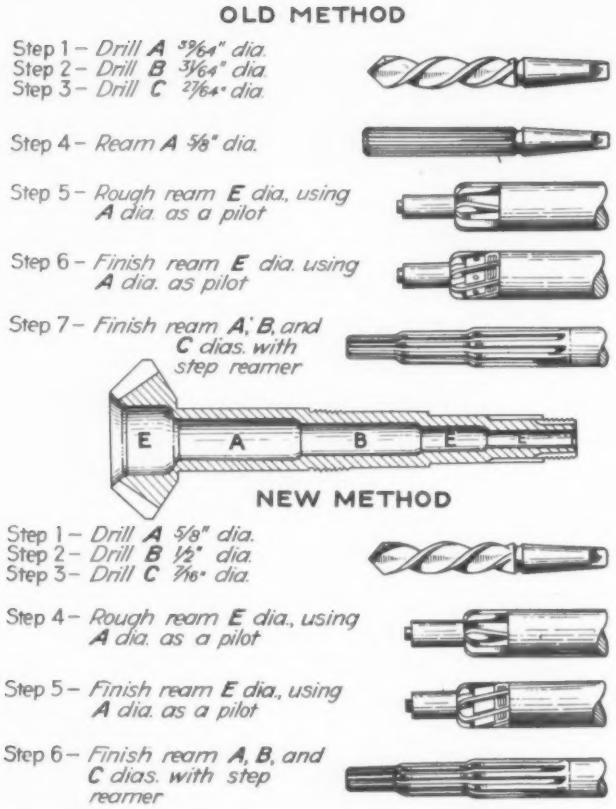


Plate Hook Solves Safety Hazard

The usual type of crane hook or plate lifter is not entirely satisfactory for handling many types of plates during assembly operations on ship substructures. One such part is the bottom floors of tanks. These are mounted in a vertical position, being swung into position by crane and held there while preliminary work is done.

The common crane hook or clamp permits the floor to tilt back and forth during the preliminary fitting up, thus creating a safety hazard. This tilting can be eliminated by using the hook shown in the drawing. It slips into the lightening holes in the inner floor plate, permitting the plate to be laid vertically on the tank top under full control. *Suggested by E. L. Paulson, Marinship Corporation.*


OLD METHOD
Step 1 – Drill A 59/64" dia.
Step 2 – Drill B 31/64" dia.
Step 3 – Drill C 27/64" dia.
Step 4 – Ream A 5/8" dia.
Step 5 – Rough ream E dia., using A dia. as a pilot
Step 6 – Finish ream E dia. using A dia. as pilot
Step 7 – Finish ream A, B, and C dias. with step reamer
E
A
B
E
E
NEW METHOD
Step 1 – Drill A 5/8" dia.
Step 2 – Drill B 1/2" dia.
Step 3 – Drill C 7/16" dia.
Step 4 – Rough ream E dia., using A dia. as a pilot
Step 5 – Finish ream E dia., using A dia. as a pilot
Step 6 – Finish ream A, B, and C dias. with step reamer

Retooling Saves One Machine

One gear shaft for an airplane engine has a stepped hole throughout its length, as shown in the drawing. The original method for machining this hole required seven operations, six of which were performed on a turret lathe. The shaft had to be set up in another machine for the seventh operation. It was suggested that the job be retooled so that the shaft could be finished in one set-up on the turret lathe.

Under the old method, sections *E* and *A* were drilled to a diameter of $\frac{29}{64}$ in., section *B* to $\frac{31}{64}$ in., and section *C* to $\frac{27}{64}$ in., requiring three stations on the turret. Section *D* was drilled on another machine prior to the turret lathe set-up. As a fourth operation, sections *E* and *A* were reamed to $\frac{5}{8}$ in. diameter so that the roller pilots could be centered accurately for counterboring *E* as indicated by steps 5 and 6 in the drawing. The seventh operation in the old method, requiring the shaft to be chucked in a new machine, was to ream sections *A*, *B* and *C* with the step reamer.

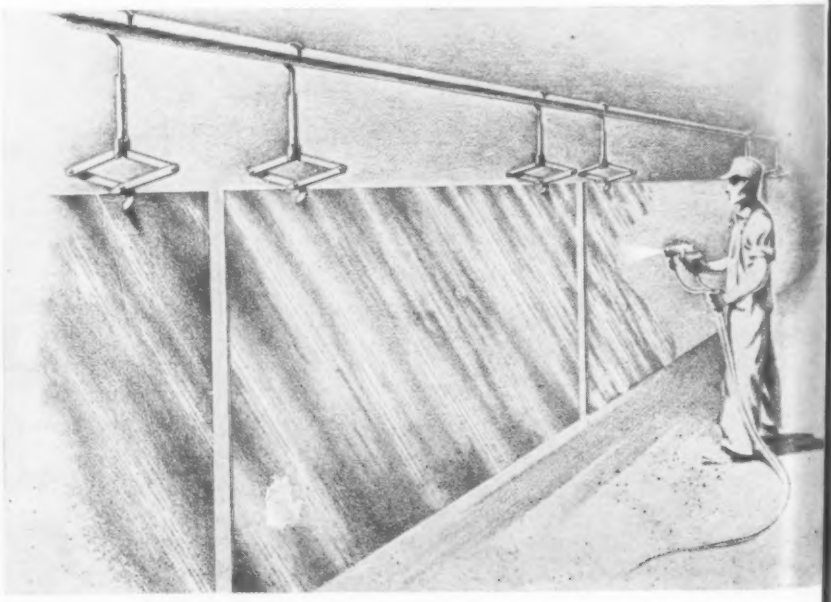
By eliminating the fourth step, reaming section *A* to $\frac{5}{8}$ in. diameter, all of the above operations could be performed in one set-up in the turret lathe. This was done by changing the drill sizes for sections *A*, *B* and *C* to $\frac{5}{8}$, $\frac{1}{2}$, and $\frac{7}{16}$ in., respectively. It was found that the drilling operations could be done with sufficient accuracy to make this change practical; that is, when section *A* was drilled to $\frac{5}{8}$ in. diameter, sufficient accuracy could be maintained without reaming to center the roller pilots of the counterborers for finishing section *E*. Therefore, by eliminating step 4 in the old method, a station could be provided on the turret for the step reamer used to finish sections *A*, *B* and *C*.

All operations are now performed on one machine. Each piece is chucked but once, eliminating a second set-up and freeing the second machine for other work. *Suggested by George Smolarek, Aircraft Engine Division, Packard Motor Car Company.*

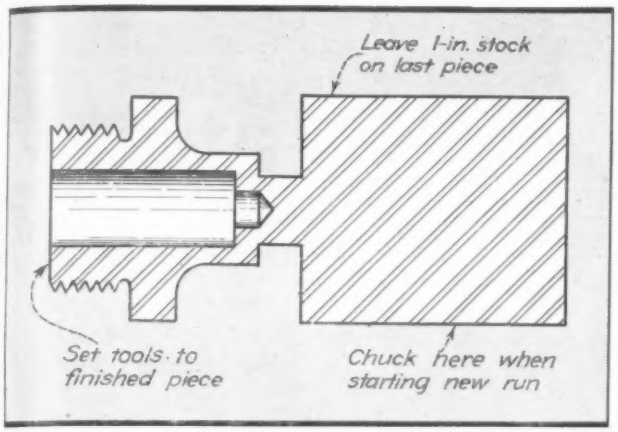
Clamps Hold Painted Sheets

The illustrated clamp will speed the priming of sheet stock used in the fabrication of airplane parts. Production of 30 sheets an hour was all that could be obtained when the sheets were placed on A-frames for painting, and unless extra time was allowed for drying the sheets frequently stuck together after loading on trucks.

The new method, suspending the sheets from an overhead rail with the aid of "ice-tong" clamps, makes possible the painting of 50 sheets an hour. Without any increase in drying time over that previously allowed, the sheets can be loaded on trucks without fear of them sticking together. This method also eliminates the cleaning of A-frames formerly used, thereby saving from three to four hours labor each week. The cost of the clamps is but a fraction of the cost of the A-frames, and requires no floor space when not in use. *Suggested by Clifford L. Nelson, Northrop Aircraft, Incorporated.*



SUGGESTIONS ★ ★ ★



Speeds Set-up of Screw Machines

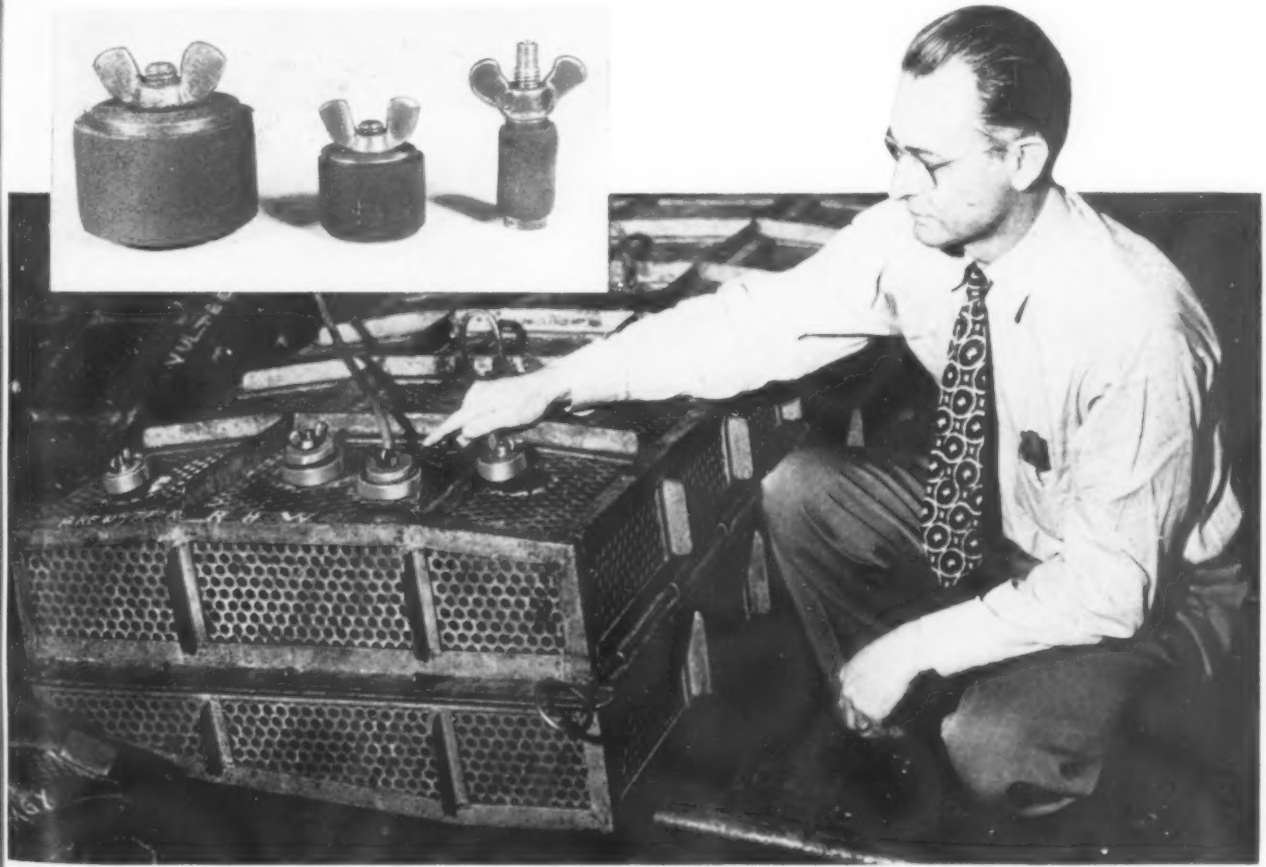
When finishing a run of parts on a screw machine, much set-up time can be saved the next time this part is to be machined if approximately 1 in. of stock is left on the last piece of each run. If such a sample piece is available when a new run is started, it can be held in the chuck or collet, thereby giving the set-up man a definite size to which to set his tools and stops. Aside from saving set-up time, spoilage of several work pieces will be eliminated, since that is usually what happens when setting tools on a new job.

Since this suggestion was made, it has been adopted in this plant for all screw machine work. It has saved many minutes on small jobs, and from two to three hours on large ones. *Suggested by Harry Conant, Submarine Signal Company.*

Rubber Plugs Seal Gas Tanks

When testing airplane gasoline tanks with compressed air, the air hose is usually inserted in or over one of the gas-line fittings and held in place with wire while the test is being made. Other holes in the tank are sealed with closed tubing. Instead of following this practice, expanding rubber plugs can be used, one of which has a through hole for attaching the air hose. All other plugs are solid to seal the remaining holes.

These plugs have a through bolt and wing nut, top and bottom washers with a rubber plug between them. When inserted in a hole, it is sealed when the wing nut is tightened to expand the rubber. Eighteen different sizes of plugs are used currently on tanks being built in this plant. They can be applied quickly, eliminating injury to the tanks which occurred with the old method. *Suggested by W. L. Hill, The Goodyear Tire and Rubber Company.*



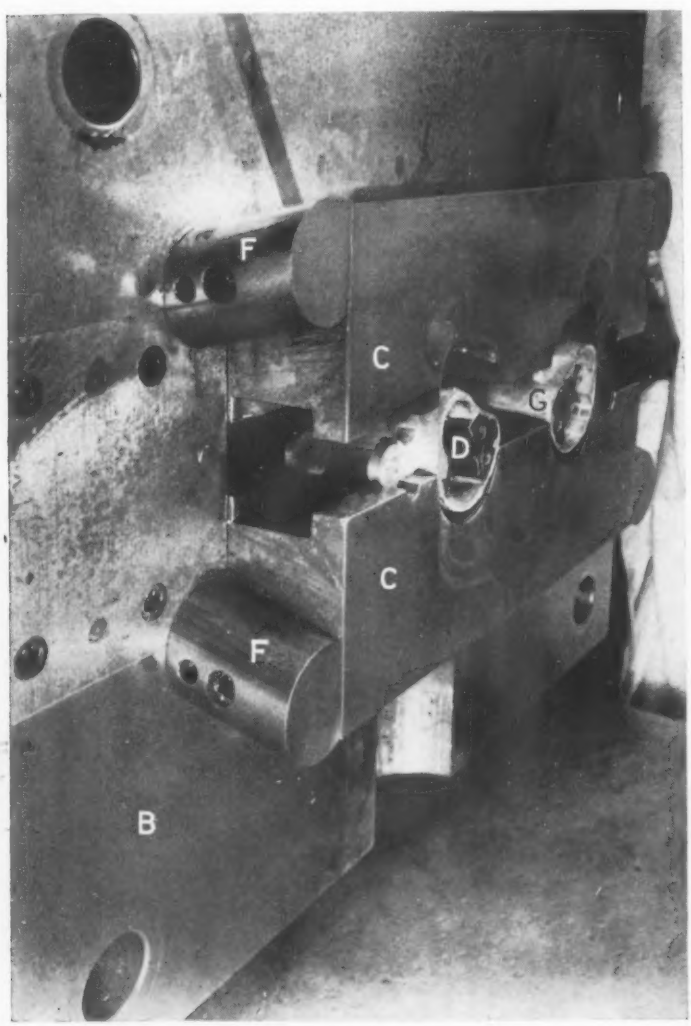
Die-Casting Mold Parts Two Ways

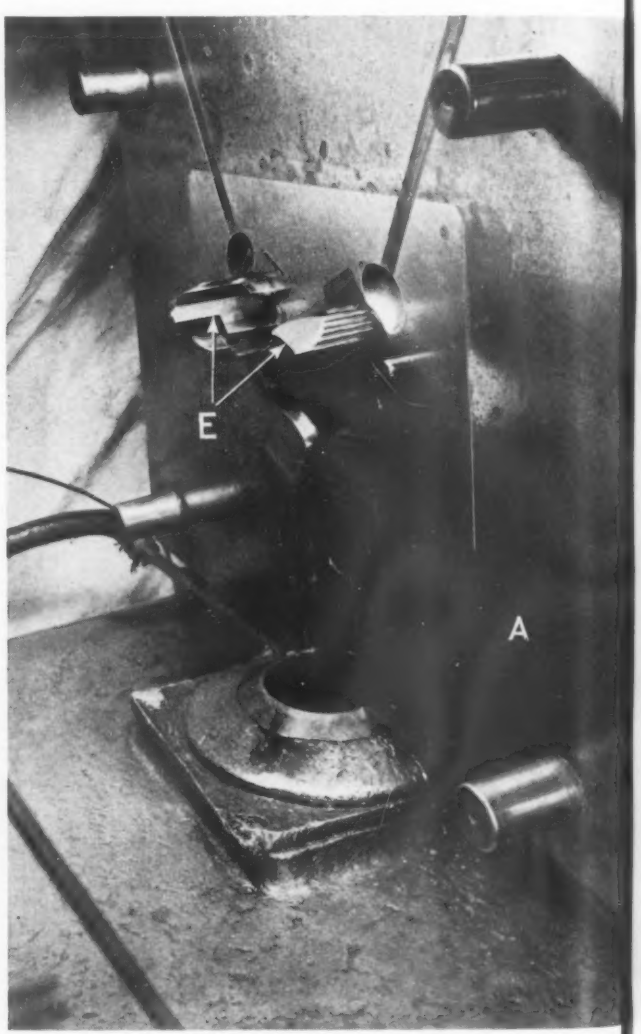
BY HARRY THORNTON, WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY

When the die-casting design did not lend itself to the use of a single-parting mold, one was built that parted vertically and horizontally. Rejects were less than 1 percent on 90,000 parts

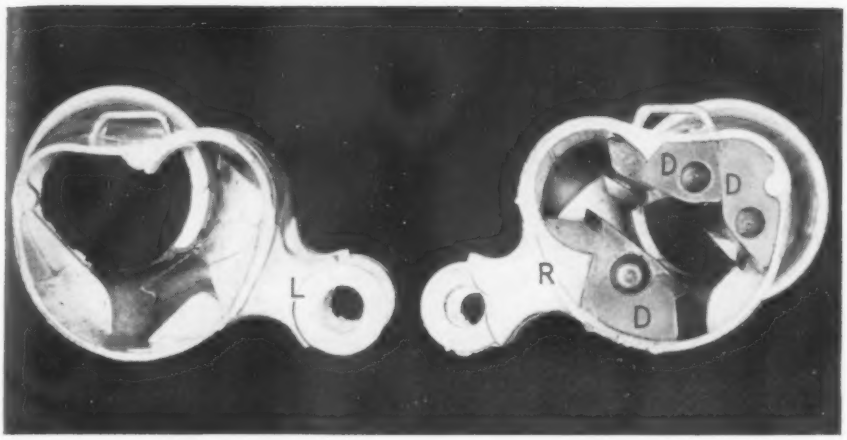
A COMPLEX aluminum die casting with bosses cast on the inside surface and an irregular contour on the outside surfaces is in production at the Westinghouse plant in Springfield, Mass. Because of the inside bosses and irregular outside contour, the casting did not lend itself to ordinary principles of die-mold design. In order to produce the inside surface a collapsible core was definitely indicated, but because of this core it was not practical to produce the outside surface, with its back draft, in a die mold with a single parting along the vertical faces of the two halves of the die.

The problem was solved by designing a die mold with a two-way parting of the die sections as shown in the illustrations. By this is meant a regular parting between the stationary half *A* and the movable half *B*; in addition, movable half *B* is in two parts *C* which separate in a transverse direction as the opening movement of the machine continues. This design permitted the placing of three removable members *D* of the collapsible core into the die mold by sliding these parts into dovetailed slides on the permanent member *E* of the collapsible core lo-





The movable half of this die mold is split so its two parts separate in a transverse direction as the two major die sections open after the casting has been formed. This design permitted the use of sliding collapsible cores on dovetailed slides to form inside bosses in the die casting



cated on the stationary half of the die mold. Each of the two die sections that form the outside contours of the casting is mounted on single slides *F* and move in and out of an opening in stationary half *B* of the mold. This enables all die section parting surfaces to be closed together and clamped tightly to prevent excess flash even when casting with metal under very high pressures such as used on this particular job.

During the opening of the die mold the removable members of the collapsible core are drawn off the permanent member and as the opening continues the two movable die sections part and free casting *G* with the three remaining core parts. These remaining core parts are tapped out of the casting at a bench and the core parts are ready for re-use in the die mold. Several sets of the removable core parts are used in rotation in making castings. One of the illustrations shows one casting *R* with the collapsible core members *D* inside the casting as it comes from the mold. Another casting *L* has been finished and shows the core members removed.

This die design has proved itself in use by producing 90,000 castings with less than 1 percent rejections. Over 30,000 castings were produced without a shutdown due to mechanical trouble, and that was only of a minor nature.

Rubber Stamps Save Drafting Time

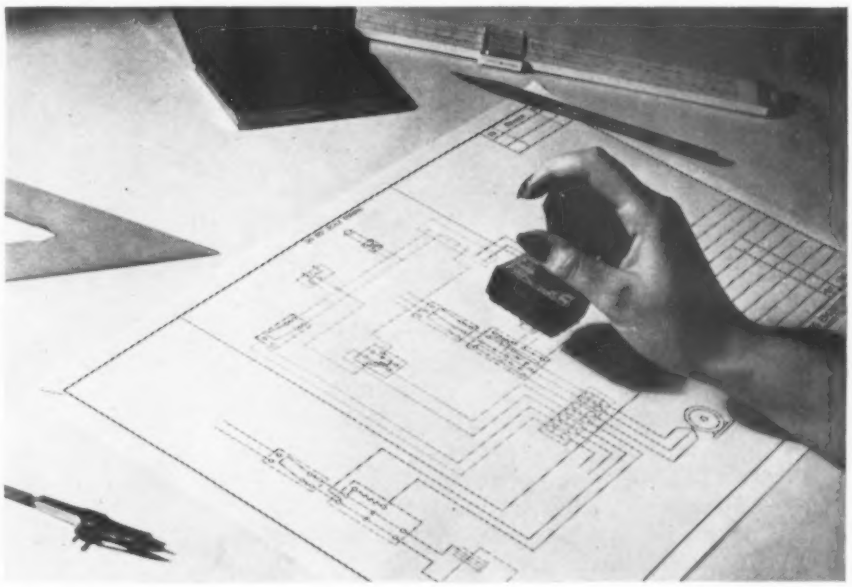
BY L. H. REMIKER, CHIEF ENGINEER, LINDBERG ENGINEERING COMPANY

TODAY WE constantly hear of the necessity for increased production, with emphasis placed on new tools, methods, processes and plant layout, which will give us greater output per man-hour without sacrificing quality or workmanship. It is very difficult, however, to design new tools, to change processes, or to rearrange a shop layout to speed up production unless one has a drawing from which to work. The sooner drawings are available, the quicker it is possible to make the changes or improvements in question. In other words, a week, a day, or an hour lost in the drawing room delays production a commensurate period.

Practically all drafting rooms or engineering departments use symbols of some sort for switches, pipes and valves, to simplify the making and reading of shop, assembly, erection, or instruction drawings. These symbols are often repeated many times on the same drawing.

For years, rubber stamps have been used to speed the handling of repetitive work such as dates, names and cities. Applying a variation of this practice, we had a few symbols made into rubber stamps. The results were exceptionally good. Gradually the number was increased, and almost every week a new place is found for a rubber stamp. Symbols have been developed for a mercury switch, transformer, motor, push buttons, connector blocks, relays, motor starters, valves, governors, blowers, nameplates, solenoids. The highest price we have paid for a rubber stamp is $7.50, and it is estimated that enough was saved in draftsman hours to pay for it on a single drawing.

During the past months a considerable number of draftsmen have been taken into armed forces, particularly detail men, and it has been necessary to train girls as replacements. In this training group, the saving in time through the use of rubber stamps has been tremendous. Their convenience and the clarity of finished drawings are added advantages.



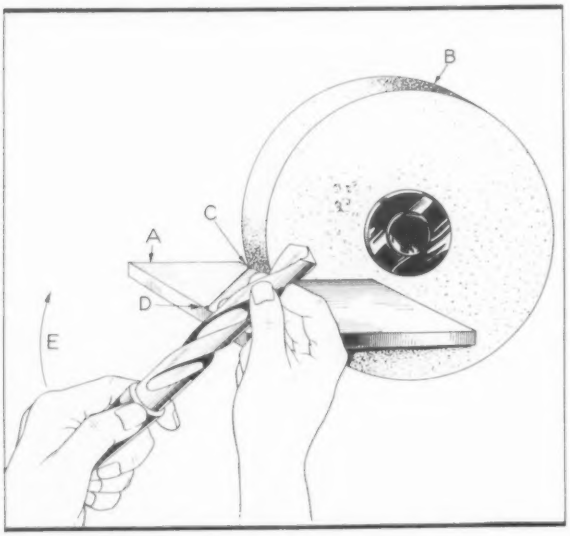
A girl "draftsman" uses a symbol stamp for a connector block while detailing the wiring diagram of a furnace to be used for heat-treatment of gun parts

IDEAS FROM PRACTICAL MEN

Method for Hand Grinding Drills

BY NELSON HALL

New drill-press operators want to grind their drills and try it at the first opportunity. Many of them can judge the length of the cutting edges very well, but the angles are troublesome, even with a gage. Since the writer has to train many of these men, he devised the following method for grinding the angles, and with it the new men soon become proficient at the work.



Lines scribed on the grinding wheel table at an angle conforming to that of the drill point help unskilled drill-press operators to grind drills properly

Set table *A* a little lower than the center of grinding wheel *B*. Scribe a line *C-D* for the 59-deg. angle of the drill point. Grasp the point end of the drill between the thumb and first finger of the right hand, leaving the third and fourth fingers rest against table *A*. Then grasp the shank of the drill in the left hand and swing the drill parallel to line *C-D* as shown in the drawing. Turn the drill so the cutting edge is on a radial line, and touch it lightly to the wheel. Then, with the left hand turning clockwise and following arc *E*, grind a clean cut around this half of the drill—the right hand is held firm against the table, acting as a pivotal point. Take several light cuts until this half of the drill is short. Turn the drill around and repeat the operations. This procedure will produce a point angle of sufficient accuracy for most drilling operations.

After grinding, the angle should be gaged, the cutting edges checked for equal length, and the clearance checked. For drills with point angles greater than 59 deg., adidtional lines *C-D* conforming to the desired angles should be scribed on the table. However, it is not advisable to have more than one line visible at a time, since unskilled men are apt to place the drill parallel to the wrong line.

Air Gun Separates Lacquered Nuts

Self-locking speed nuts, stamped from metal strip by the Tinnerman Products, Inc., Cleveland, Ohio, are placed in a revolving barrel and sprayed with lacquer. After drying, many of the small light pieces adhere. Separation of the nuts was a time-consuming job until the illustrated air-gun was devised.

The gun consists of a 3-in. diameter barrel 2 ft. long, with a 1-in. air line attached to the elbow into which the nuts are dropped. The nuts, dumped onto a tray above the gun and dropped a few at a time into the funnel, are picked up by the air stream and shot against a heavy wire screen at the end of the barrel. Hitting the screen, they break apart and fall into a basket. Air pressure of 90 lb. per sq.in. is used. Millions of the speed nuts are painted daily at this plant and are being used in the construction of airplanes and ordnance equipment.

Small speed nuts after lacquering stick together. They are easily separated by blowing them under air pressure against a wire screen

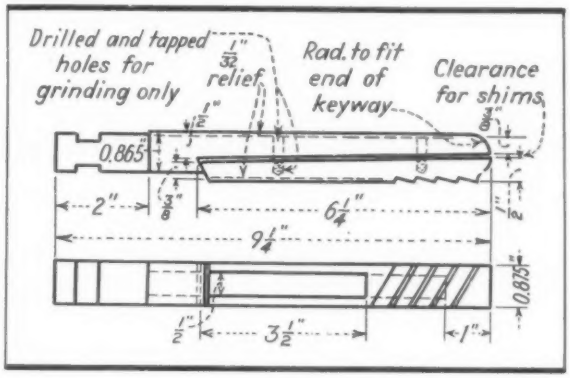
Split Broach Eliminates Chip Damage

BY CHARLES BOGUE
General Electric Company

The split broach shown in the drawing overcomes difficulties encountered in broaching a blind keyway in a shaft and coupling to a tolerance of 0.0005 in.

Initially a two-faced broach was used on the job, one side having right-hand and the other side left-hand special teeth. The opposing angles of cutting equalized the strains and facilitated a straight cut. A space was left at the tip for the accumulation of chips which could be blown out after the broach was withdrawn. However, it was found that chips from the back teeth damaged the front teeth as the broach was withdrawn, and a new broach had to be used after about a dozen cutting operations.

The illustrated broach has its shank machined to



At the end of the cut in a keyway, the shank of this broach is withdrawn, leaving the broach face free in the keyway for easy removal

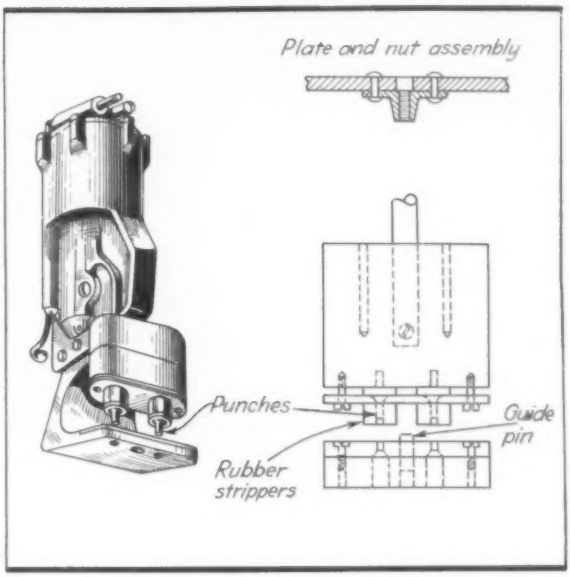
the size of the keyway, with one side cut away to accommodate a broach face. At the end of the cutting operation this shank is withdrawn, leaving the broach face loose in the keyway for easy removal. Two passes must be made to cut each keyway, but there is no damage from chips in removing the broach, and deterioration is negligible. By regrinding the teeth and placing shims between the broach and the shank, the life of the broach is extended materially.

Adaptor for Riveter Punches Holes

BY JOHN HAYDOCK

Plate nut rivet holes are punched two at a time by the use of a special yoke that fits a standard Chicago Pneumatic portable squeezer. The center holes in the plates are jig drilled, but two smaller holes are needed on either side to rivet the nut in place. They were formerly drilled also, but the time consumed, together with drill breakage and the necessity for burring the holes, made the operation expensive.

The yoke consists of a punch block which is aligned with leader pins. Independent punches made from



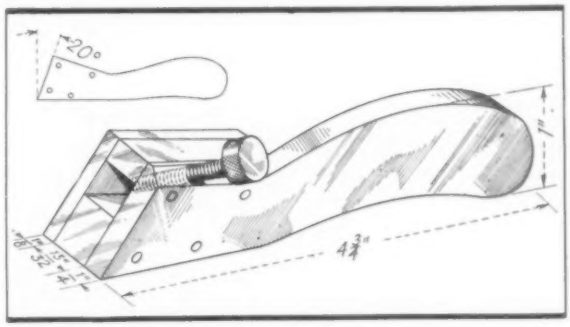
A yoke on a standard rivet squeezer permits punching holes alongside one jig drilled in sheet metal

heat-treated drill rod may be replaced in a few minutes by removing two screws in the punch plate. Rubber bushing on the plate serve to strip the stock from the punches. The hardened removable die plate has a guide pin in the center to locate the work from the jig-drilled center holes. The pneumatic squeezer gives a pressure of 3,000 lb., and is capable of piercing duraluminum sheets up to 0.064 in., and stainless steel half hard or full hard up to 0.040 in. This tool was designed by Vega Aircraft Corporation tool engineers and is now in constant use.

Holder Speeds Grinding of Toolbits

BY MARTIN H. BALL

Toolbits from $\frac{3}{16}$x$\frac{3}{16}$ in. to $\frac{3}{8}$x$\frac{3}{8}$ in. can be ground with the illustrated holder. The knurled head clamping screw with a hardened point bears on an upper



This toolholder was designed for grinding toolbits, which can be extended to clear the guard or any interference on the grinding wheel stand

corner of the toolbit, forcing it to a bearing in the opposite lower corner of the holder. The slot is at an angle of 20 deg. to the base, as are the slots in

most of the toolholders in which such bits are held for grinding.

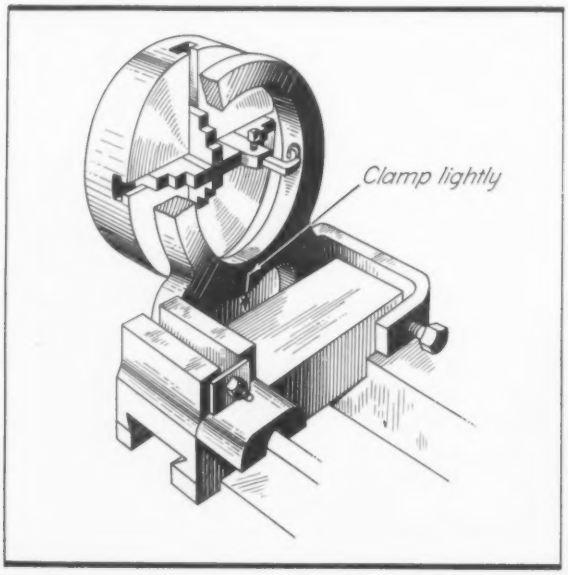
Toolbits can be ground easily in this holder since it requires no wrench. It does not take a standard toolholder out of service while grinding bits, and can easily set with the bit extended to clear the guard or any interference on the grinding wheel stand. This holder was made up of small sections riveted together to avoid a broaching operation, and has proved entirely satisfactory.

Accurate Adjustment of Steadyrests

BY WILLIAM S. ROWELL

A properly made steadyrest is bored concentric with the spindle of the lathe on which it is to be used. This makes setting either long or short work easy, and should obviate the use of an indicator as advocated by Frank E. McLane (*AM*—Vol. 87, February 4, 1943, page 91). A steadyrest can be bored concentric by holding the boring tool in the lathe chuck as shown in the drawing—the steadyrest is clamped lightly to the ways and fed to the cut with the lathe carriage.

It is easy to center work in a cencentric steadyrest by calipering from the bore to the work, which is seldom necessary except when the work is so long as to prevent the use of the quicker and more accurate method described below.



When boring a steadyrest concentric with the lathe spindle, clamp it lightly to the ways and feed it with the carriage to a tool mounted in the chuck

Clamp the work true in the chuck with the outer end approximately true in the steadyrest, the jaws of which are not clamped. Put the spindle in slow motion and allow the top jaw of the steadyrest, which is not clamped, to rest on the work. Any eccentricity of the work will cause this jaw to rise and fall slightly by an amount equal to double the eccentricity of the outer end of the work. Screw this jaw down until the rise and fall of the work—judging by eye—is reduced to about one-half. Adjust the lower jaws uniformly until they lightly touch the work. Bringing the tailstock center against the work will show how to adjust the jaws of the steadyrest so the work is near center. A small depression may then be made with a pointed tool to receive the combination countersink and drill. It is best to hold the drill chuck in the hand with its shank end against the tailstock center. The three jaws of the steadyrest can then be freed, and the tailstock center brought up to the work and adjusted before finally adjusting the steadyrest jaws. I have found this procedure more satisfactory than the one described by Mr. McLane, which for work of any length is in my opinion far from accurate.

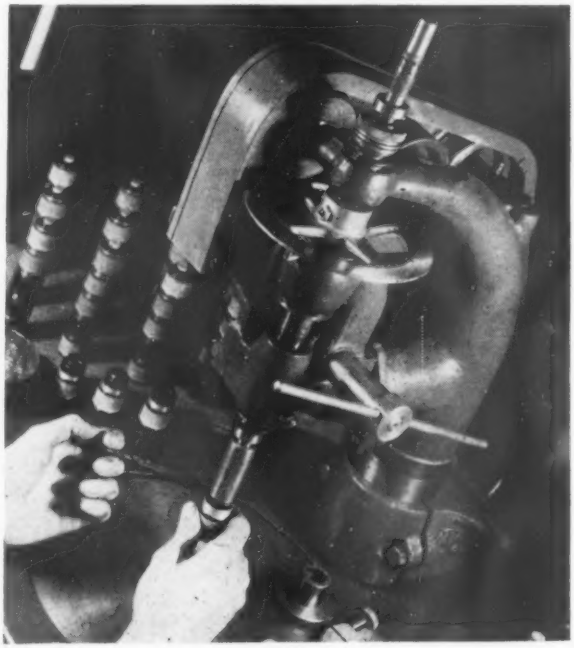
Threads Lapped in Tapping Machine

BY VICTOR S. VOIGT

Westinghouse Electric & Manufacturing Company

A standard tapping machine may be used to perform the delicate tapping operation on female threads in aluminum parts. The set-up for doing the job is shown in the illustration. The problem in this work is to avoid applying too much pressure and destroying the soft threads.

The lapping compound is applied by the left hand with the aid of a brush, and the right hand holds the part against the lap, which is mounted on the end of the spindle in the tapping machine. Forward and reverse speeds of the spindle permits the female thread to pass up and down over the male threads on the lap until the threads have been lapped to the proper fit.



This standard tapping machine is used for lapping female threads on aluminum parts

Armament

SECTION OF AMERICAN MACHINIST

Timed Operations Pace Conveyors in "Vengeance" Bomber Assembly

TO GET FAST PRODUCTION of "Vengeance" dive bombers with a working force made up mostly from clerks, waitresses, farmers, students, housewives, teachers and garage mechanics, Vultee engineers made use of nearly every trick in the bag of modern assembly technique.

The final plan is based on completion of every possible assembly operation in the subassembly stage to shorten final assembly time. Every stage and every operation in the entire assembly process was and continues to be studied for work simplification and motion economy. Work holding fixtures permit each part of the job to be done with the utmost in ease and speed. Every station is planned for stop-watch precision in timing to avoid either waiting for or piling up of parts or subassemblies. Final assembly is done with the work suspended in non-swaying adjustable hangers

By ROBERT McCULLOCH Division Manager, Nashville Division, Vultee Aircraft, Incorporated

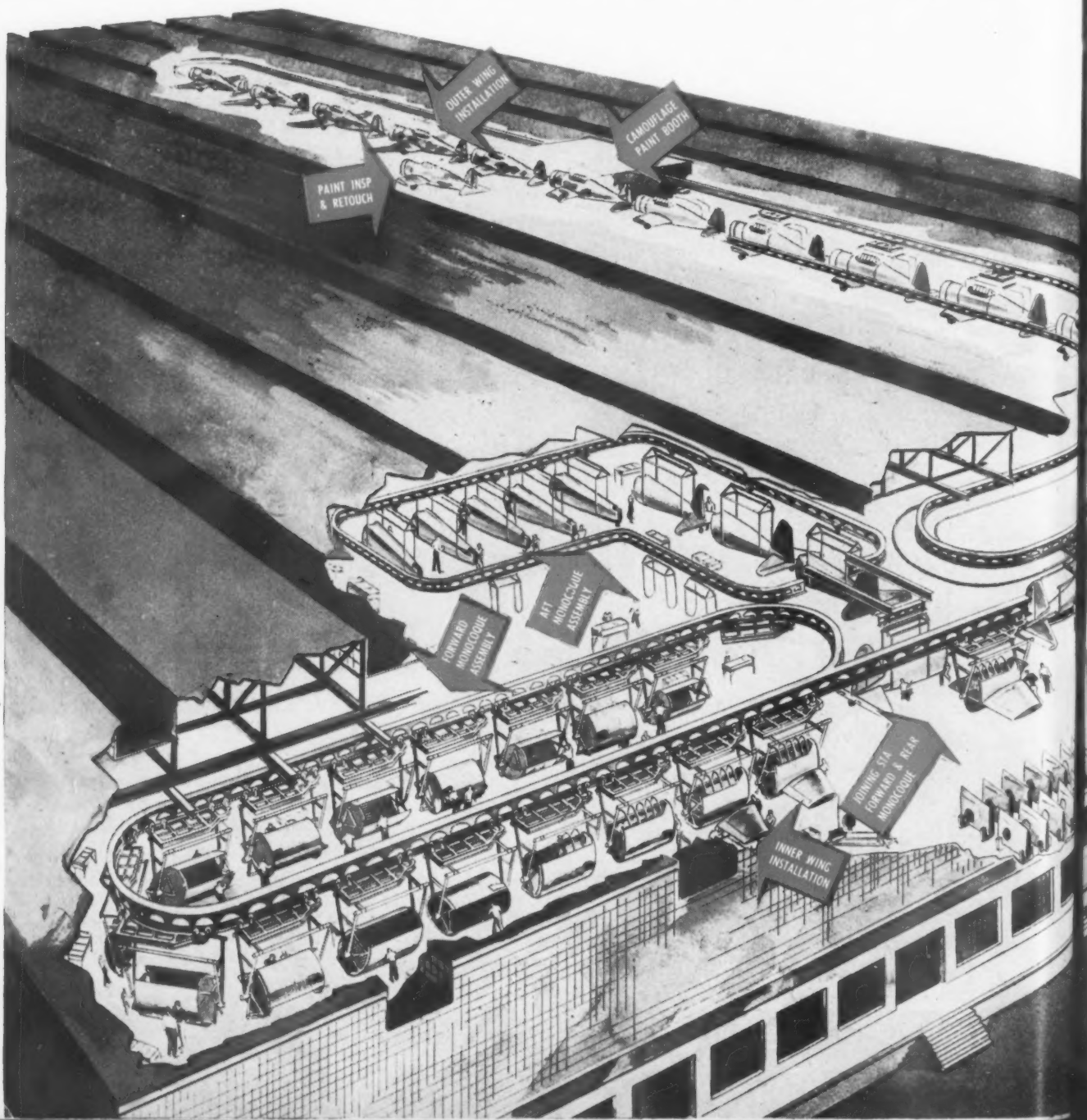
"VENGEANCE" BOMBER ASSEMBLY

that travel along mechanized overhead conveyors, and with workers standing on the floor or on platforms.

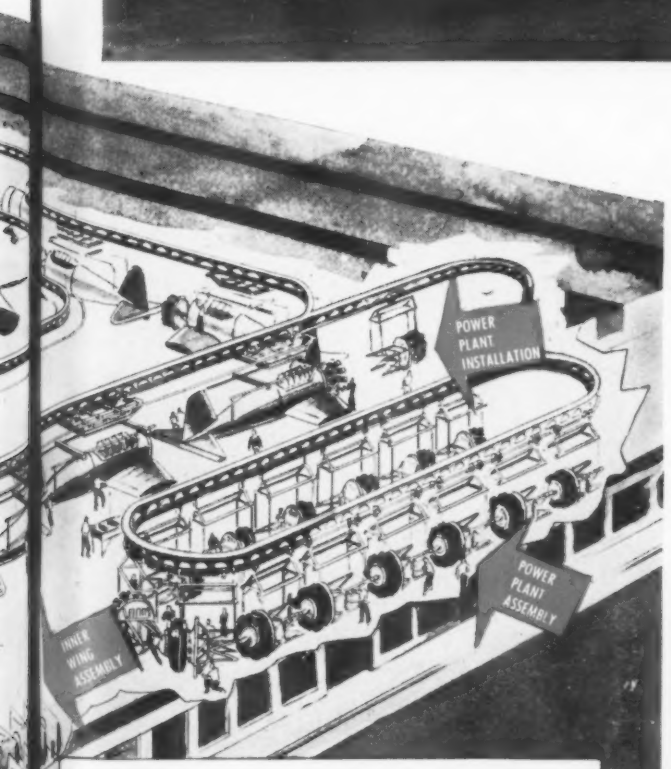
Powerful, fast and deadly, the Vultee "Vengeance" bomber (A-31) used by both the American and the British air forces has a number of features that make it one of the world's highest performing land based dive bombers. This new single-engined, two-seater plane has a load capacity of more than 2,000 lb. and an unusually long range, enabling it to penetrate deep into enemy territory. In addition to heavy armor plate to protect the crew and vulnerable parts of the plane, high caliber wing guns for strafing and protection, and twin mounted guns in the rear cockpit, the "Vengeance" features hydraulically-controlled dive brakes and efficient rudder control.

Every manufacturing and assembly operation required for the production of the "Vengeance" dive bomber is analyzed frequently by men familiar with the principals of work simplification and motion economy. In addition, shop supervisors and production workers are given an apportunity to attend classes in which these subjects are discussed. As a result, the total man-hours required to manufacture the plane has been reduced progressively as the efficiency of individual operations has increased. A byproduct of this program has been a marked reduction in manufacturing floor-space required for a number of the operations, thereby freeing plant areas for other activities in an enlarged production program.

In the manufacture of subassemblies for delivery to the final assembly lines, production operations—in so far as possible—are divided between "qualitative"



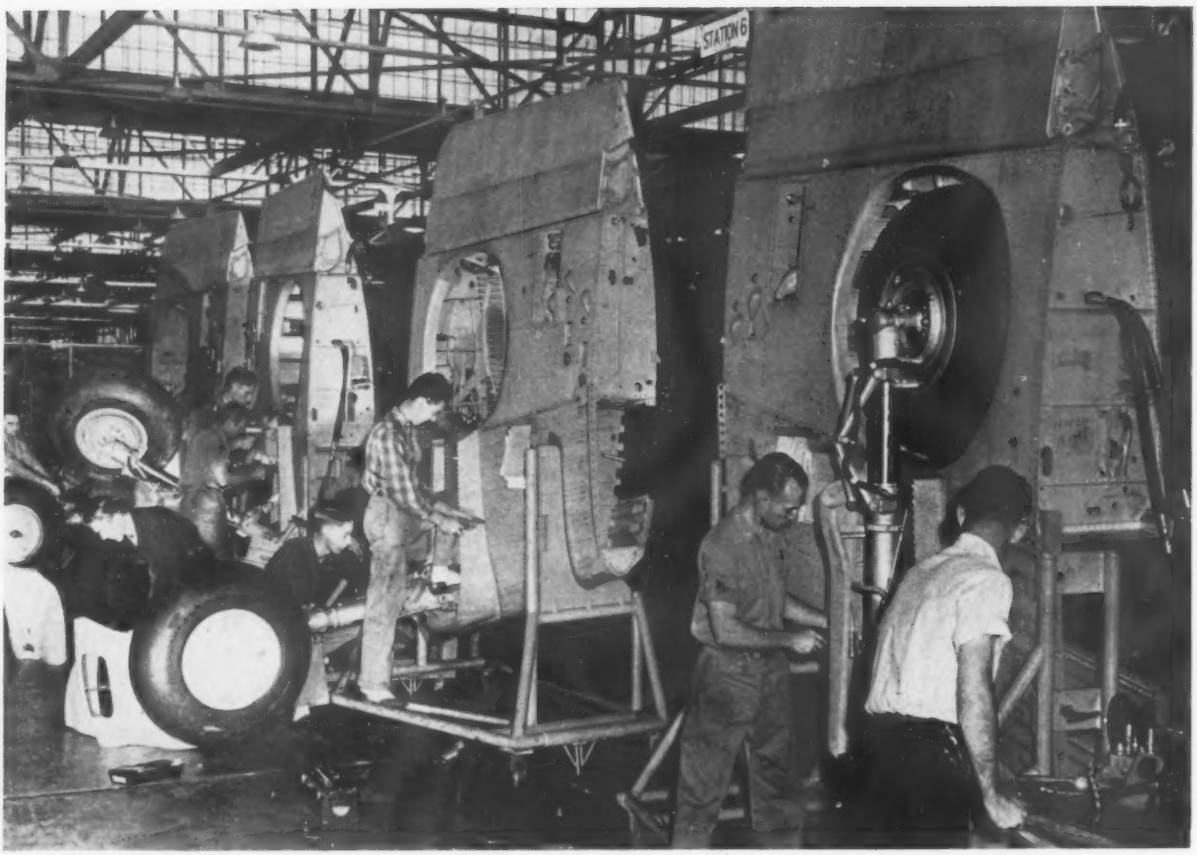
Forward monocoque assemblies are suspended from hangers that permit rotating each assembly to any position required. Work performed at each station is scheduled so it can be completed within the conveyor's cycle time



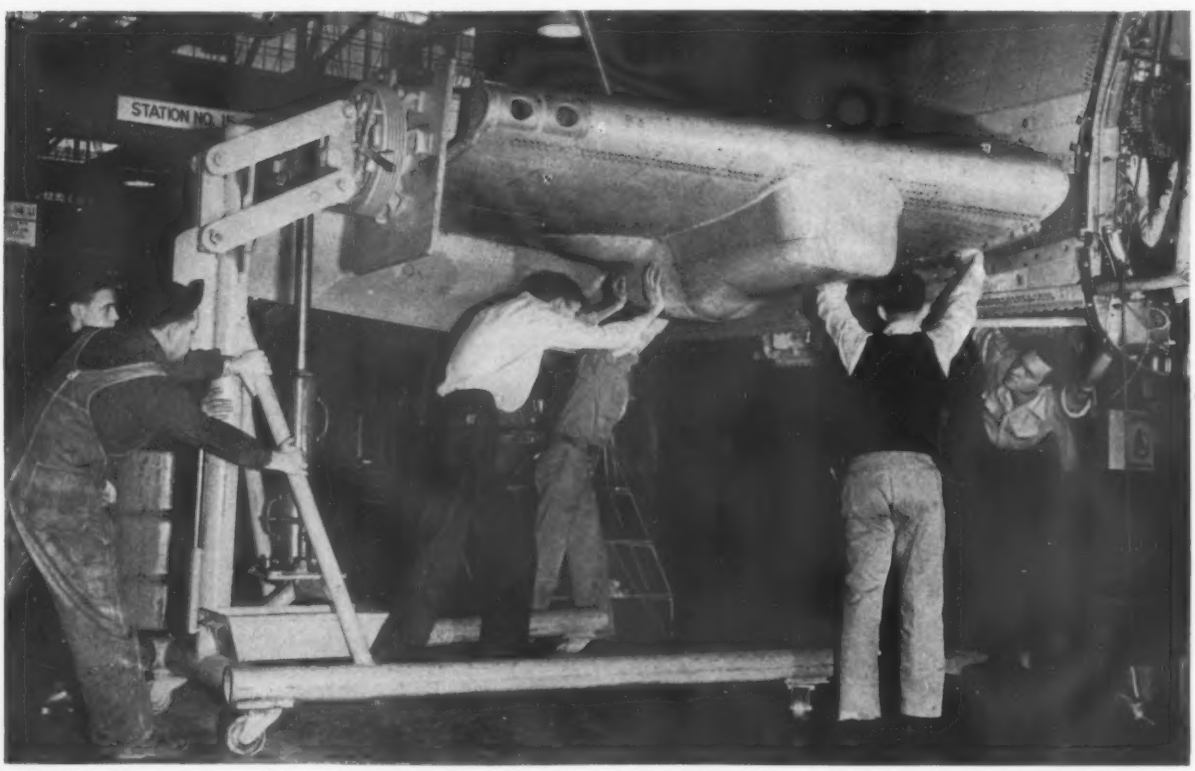
Vultee's final assembly conveyor for "Vengeance" dive bombers is supplied with fuselage, inner wing and power plant units made ready on feeder conveyor lines arranged as shown. Hangers on each of these lines are designed to position the work conveniently for assembly operations

and "quantitative" operations. In the first classification are those operations which involve dimensional control or interchangeability of the product; while in the second group are those operations necessary for the assembly of the product after the necessary dimensions have been established. This procedure has a number of advantages.

A jig or fixture made for a "qualitative" operation is designed primarily to insure the production of a part or subassembly that will satisfy specification requirements and will assemble, with a minimum of fitting, with other subassemblies to make up the complete airplane. Every dimension is controlled by the jig or fixture itself. The work done in one of these tools is held to a minimum. The parts that make up the subassembly are fitted into place and clamped, then holes are drilled and quick-acting fasteners are inserted where necessary to hold the parts together. Actual riveting and the attachment of small clips, angles, braces and other fittings that do not require accurate location, is left until the subassembly is removed to a "quantitative" fixture—usually a pick-up stand—for finishing. This procedure holds to a minimum the length of time that the large, and usually expensive,



Right and left inner wing assemblies are made ready for the forward monocoque line in fixtures moved from station to station down a nearby feeder line. When ready, these assemblies have been checked to insure proper operation of the landing gear mechanism



Special lift trucks have been developed for transferring inner wing units from the assembly fixtures to the forward monocoque line. A hydraulic jack raises or lowers the unit for alignment with mounting bolts

"qualitative" jig or fixture is tied up in making a given part. It reduces to a minimum the number of such tools needed to maintain a given production rate on those parts.

Every effort is made to reduce the time needed to put a subassembly together in one of these "qualitative" tools. They are designed to keep the principal operations at a normal work level, and to hold the work in such a position that the workers at this station can perform the necessary operations conveniently. Quick clamping devices are provided wherever they make the operations easier to perform, and mechanical work handling devices are provided wherever possible. Jig plates are mounted on the fixture so they can be swung easily into position when drilling is to be done, and then swung out of the way for removing the work when operations have been completed.

Rotating Fixtures Are Used

Pick-up stands or "quantitative" fixtures are designed to hold the partially completed subassembly in a convenient position for completing the work started in the original fixture. Many of these fixtures are made so the work can be rotated about a horizontal or vertical axis to make the work easier to perform. Frequently these fixtures are mounted on casters so they can be moved along a line of "work stations" for progressively finishing the operations required on the subassembly. The "quantitative" fixtures usually are simply constructed and are not very expensive, so a number of identical fixtures, as would be necessary for a "stationed" progressive assembly line, can be provided at less expense than would be incurred if each subassembly were to be finished in a more costly "qualitative" fixture.

Wherever possible, the larger subassemblies are delivered directly from the work stations where they are finished onto carriers on the final assembly conveyor lines. Often these large subassemblies, such as the forward and aft monocoque sections for the fuselage, consist of a number of smaller subassemblies progressively put together in subassembly groups equipped with a succession of "qualitative" and "quantitative" fixtures.

A number of interesting features have contributed to the success of the final conveyor assembly lines installed for the production of "Vengeance" dive bombers. First of all, the conveyor lines have been divided into five separate groups—a final assembly line and four feeder assembly lines—with each line a complete unit in itself. Another feature is the mobility of units of work in process. The work carriers on each of the conveyor lines has been carefully designed for the major subassembly it is to transport and, where necessary, each of these subassemblies, as well as the final assembly carried by the final conveyor line, can be raised, lowered, tilted or swung in an arc mechanically to suit the convenience of the operators at any of the work stations. The feeder conveyors have been arranged in the plant in such a way that subassemblies generally can be delivered directly to the loading station of the conveyor line on which they are to be used. Furthermore, the feeder conveyors are arranged with relation to the final assembly conveyor so the units are delivered to stations as needed.

The forward monocoque assembly line, generally considered the most important of the four feeder conveyor lines, is equipped with rotatable hangers sus-

Small parts and subassemblies are delivered as needed to assembly stations in special trays. Larger parts are placed on the racks beside the trays

pended by steel cables from Cleveland "stabilized" tramrail carriers. These carriers are interconnected by endless link chain and speed of movement is regulated or timed by variable speed motor drive. With the subassembly in position in one of these hangers, it can be rotated 360 deg. about its horizontal axis so as to bring any side into position for easy access. Further, the hanger can be raised, lowered or tilted by adjusting the supporting cables. Any part of the forward monocoque assembly can be brought into position to enable the assemblers to work in comfortable, upright positions. As the suspended hangers carried on this conveyor line are independently adjustable, the position of a given assembly can be changed whenever necessary as the unit is moving from station to station along the line.

Assembly operations at the various stations along

the forward monocoque assembly line have been carefully analyzed, and are divided up so that the work at the various stations is completed in about the same amount of time. This base time interval also is used in planning operations that must be performed at the various stations on the other feeder conveyors, and on the final assembly conveyor. At the end of a given number of minutes, therefore, a completed plane should be ready for delivery at the unloading end of the final assembly conveyor, and that conveyor as well as all of the feeder conveyors should be ready to move the work forward one station. Otherwise the five conveyor lines would get out of balance and final assembly operations would be delayed. Careful attention has been given to the assignment of operations to each work station on each of the conveyors; workers at each station must be able to complete the work assigned within the cycle time allotted and without interfering with the work being done by other assemblers assigned to the same station.

Workers at the various stations along the forward monocoque assembly conveyor install various subassemblies such as oil lines, fuel lines, control cables, control units, hydraulic assemblies, electrical and radio wiring and subassemblies, and all the usual equipment normally installed in the cockpit and bomb bay of an airplane of this type, and then check the operation of each of the subassemblies they have installed.

Limits Tools and Parts At Assembly Stations

Placed beside the forward monocoque assembly line is a series of racks for tools and parts, each rack serving the assemblers at a given work station. Stockroom clerks deliver parts and subassemblies to these racks as needed by the various assemblers. To conserve materials and insure careful workmanship on the part of the assemblers, only enough parts are delivered as are required for the planes in process. For the smaller parts and subassemblies this delivery is effected by providing two sets of trays for each parts rack. Removable partitions in each tray serve to keep the small parts, nuts, bolts, washers and similar items separated. Each bin in the tray has a card showing the part number, name and quantity of the item to be placed in that section by the stores clerk before the tray is delivered to the assembly station.

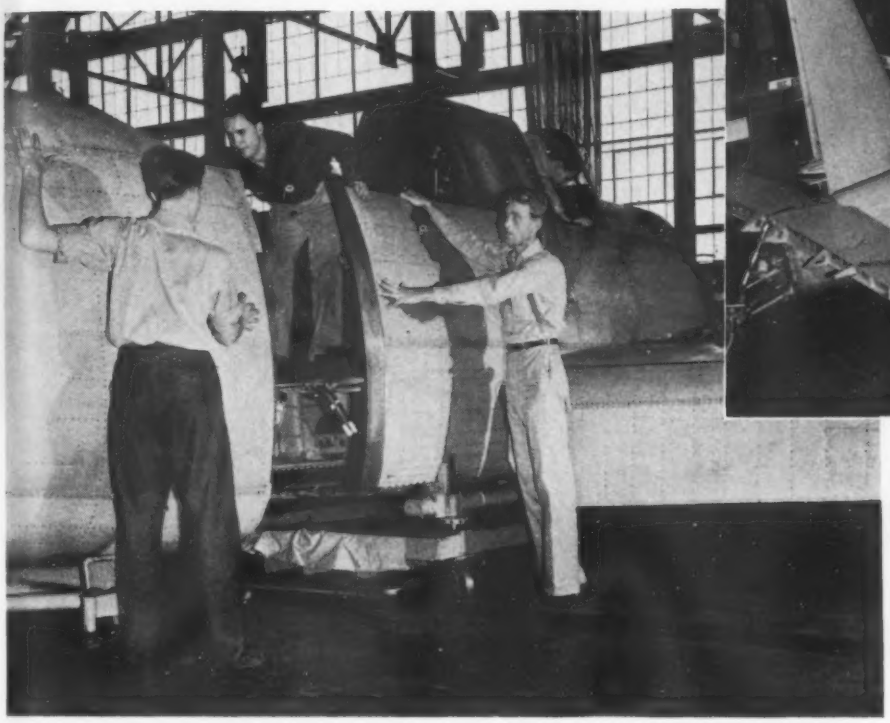
For identification purposes, one set of the parts trays is painted blue and the other brown. While the blue set, for example, is in the racks with parts available for the assemblers, the brown set is in the stockroom where the bins are being filled. Just before the assembly line is scheduled to move, the blue trays are gathered up and returned to the stockroom and the brown trays take their places in the stock racks. Parts and subassemblies too large to be placed in the trays are placed beside them on the rack shelves.

Aft monocoque sections are finished in huge vertical jigs, then transferred by chain hoist to the hangers of an overhead conveyor line for the assembly of the rear empennage, tailwheel and other subassemblies

Right and left inner wing assemblies, which are mounted on the forward monocoque fuselage members near the end of the forward monocoque assembly line, are assembled and tested on a separate conveyor line nearby. This second feeder assembly line consists, essentially, of a number of assembly fixtures mounted on casters which are moved along the line from station to station. In order to keep the fixtures in line, braced rods project downward to contact a guide rail secured to the floor. The inner wing assemblies assembled on this line incorporate landing gear mechanisms, so portable hydraulic test sets with hand operated pumps are provided for connection to hydraulic lines in the wing assemblies. With these pumps the landing gear retracting mechanisms can be operated during assembly and adjustment, and for final inspection. At the end of the inner wing assembly line, these units are fitted to special trucks which lift them from their fixtures and transport them to the forward monocoque assembly line for mounting. The supporting mechanisms incorporated in these trucks permit raising or lowering the wing assembly, or rotating it about the horizontal axis, to align it for assembly to the fuselage without further handling.

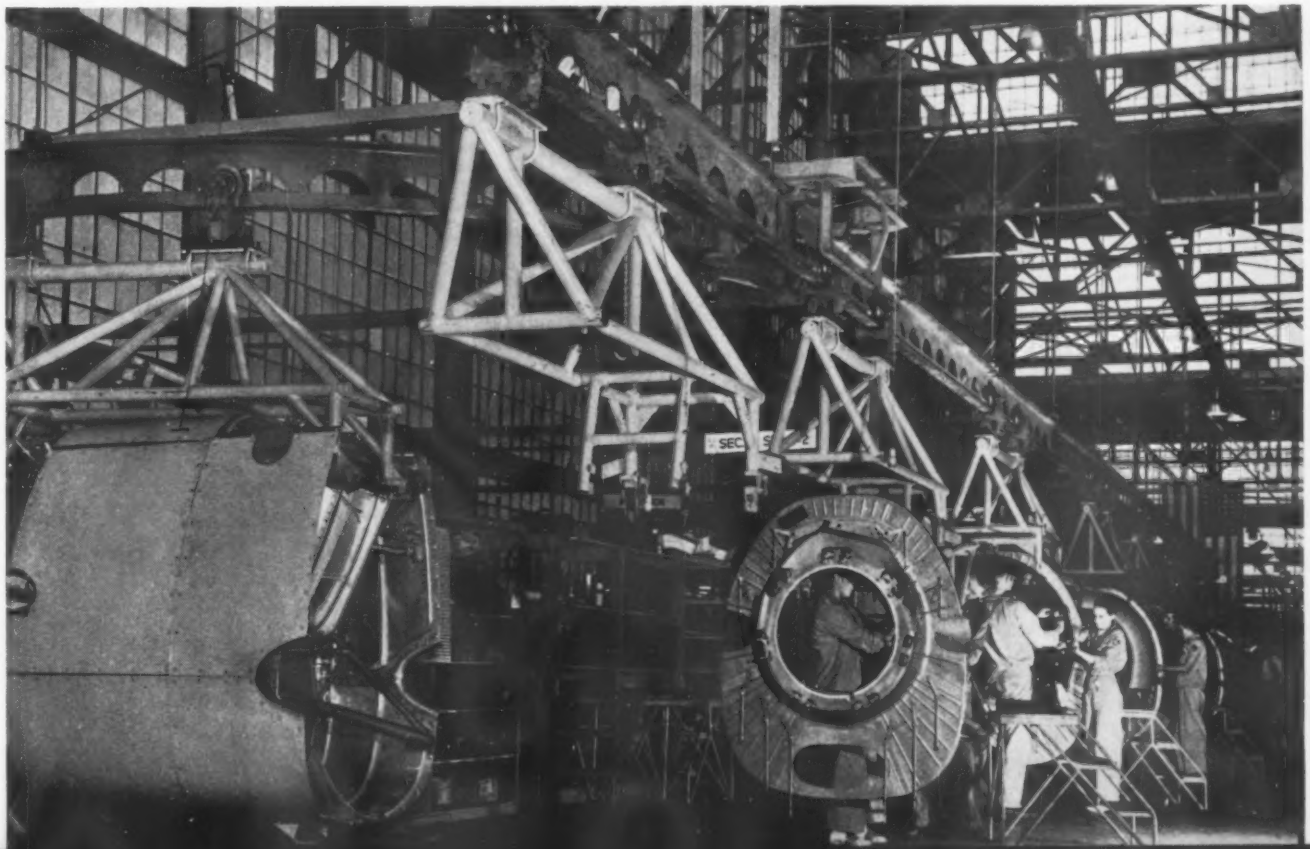
Aft monocoque assemblies are completed on the second of the three major overhead feeder assembly lines. Here, much simpler hangers are sufficient. It is not necessary to swing and rotate these members for convenient assembly, as is the case with the forward monocoque assemblies. The rear monocoque member

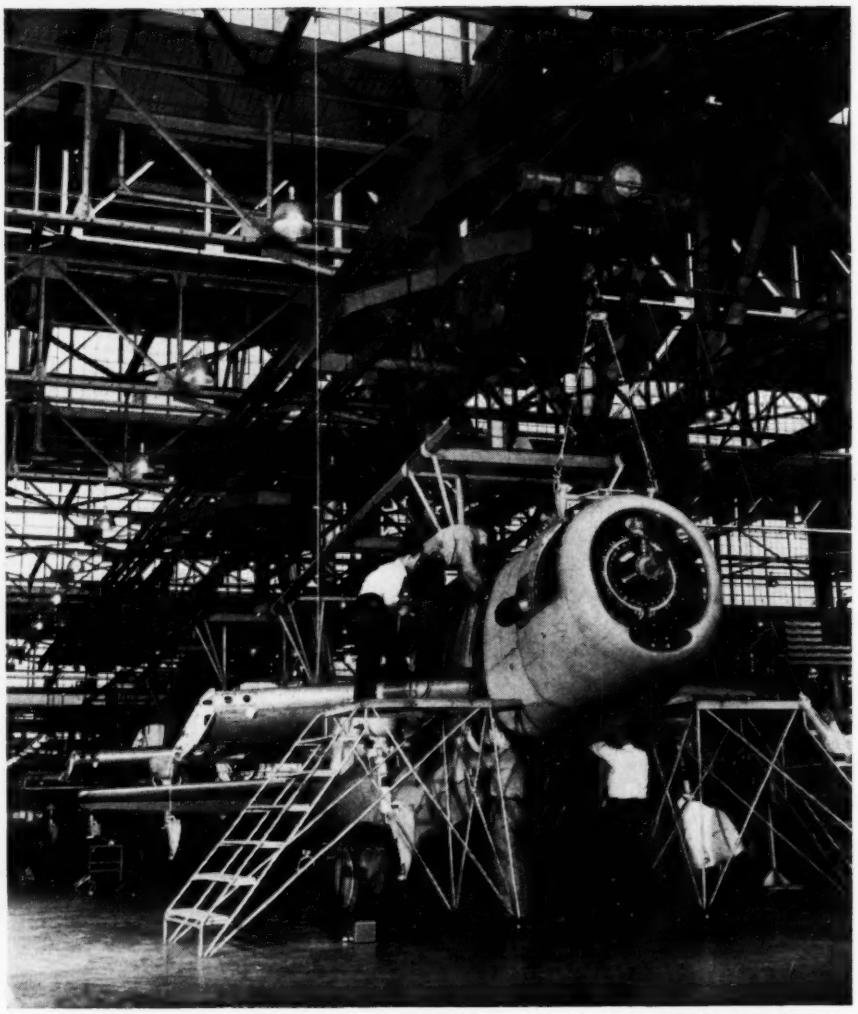
Hangers for the aft monocoque assembly line are supported from balanced tramrail carriers and are designed to hold the work steady while control surfaces are fitted and subassemblies are mounted inside the frame



Special trucks hold the forward and aft monocoque assemblies for joining before delivery to the final assembly conveyor. Leveling devices on each truck aid in aligning the two units

Hangers suspended from tramrail carriers on the power plant assembly conveyor are arranged tc hold the units at a convenient height above the floor





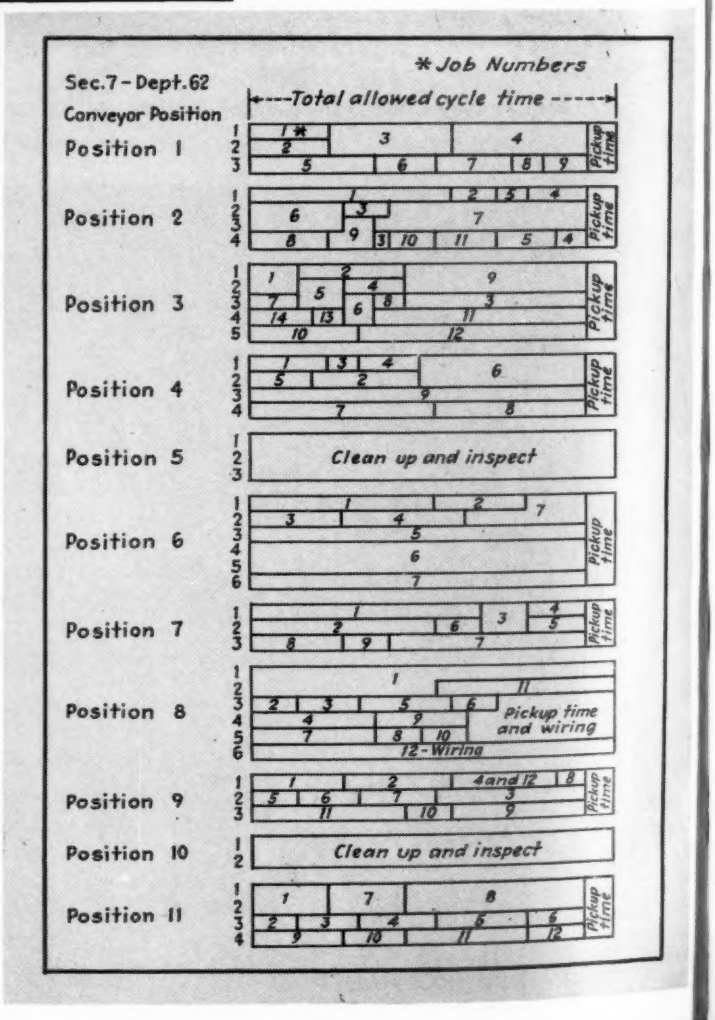
Power plant assemblies are fitted to the forward end of the fuselage near the start of the final assembly line. An electric hoist suspended from a tram-rail carrier moves the power plant from the nearby feeder conveyor and positions it for mounting

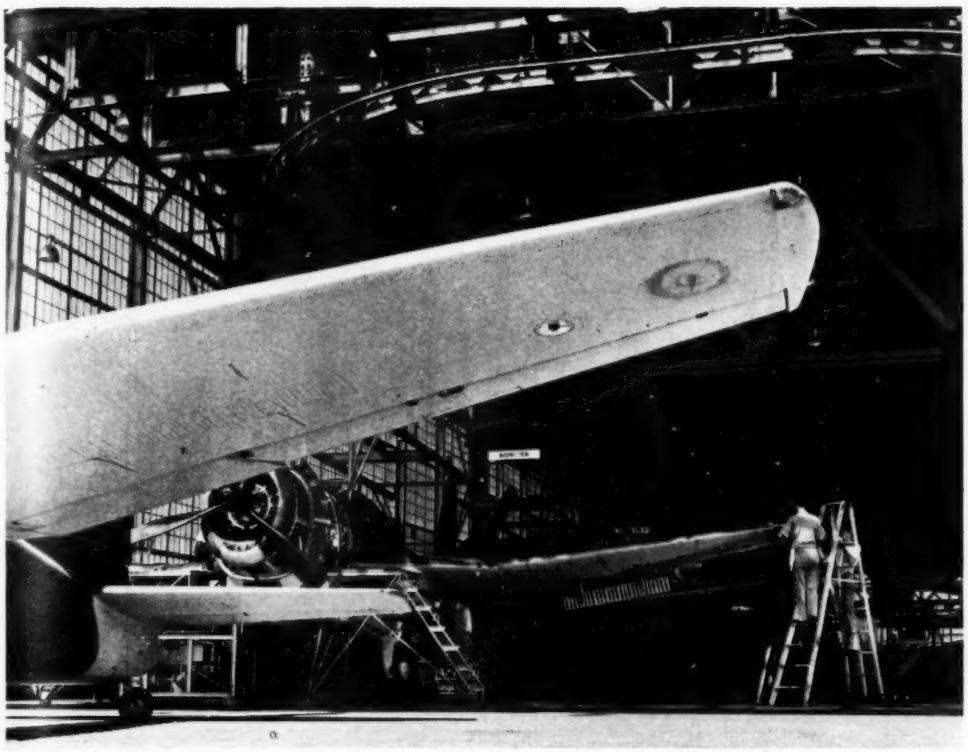
Man-time charts are made up for each assembly station to insure a balanced condition all along the line. Ample time is allowed for inspection to insure that all work is done properly

is completed in a large vertical jig, and then transferred to the overhead conveyor carrier where it is held in position by a bar through the aft section and a strap around the forward section. As considerably fewer assembly operations are necessary on the aft monocoque assembly than on the forward assembly, fewer stations are necessary on this feeder conveyor.

Unloading stations on the two conveyor lines for assembling the forward and aft monocoque fuselage sections are adjacent. Each line delivers its product to a special floor truck, the forward and aft sections then are brought into line for mating by moving the two trucks short distances along the floor. Each of these floor trucks is provided with adjustments so the two fuselage sections can be aligned with little difficulty while being pulled together. As this mating position at the end of the two main feeder conveyors is adjacent to the loading station for the final assembly conveyor, the assembled fuselage can be quickly hooked on to a final conveyor carrier once the drilling and riveting operations necessary to join the two sections have been completed.

The power plant assembly, which forms the front end of the fuselage of the "Vengeance" dive bomber, is put together and inspected on the fourth separate feeder conveyor. This power plant assembly line is





At the end of the final assembly conveyor line the dive bomber is lowered to the floor for a final check-up before delivery to the flight test field. From here, the overhead carriers move back up the line to start another plane on the way to the fighting fronts

of the overhead type, and has special carriers designed to hold the power plant assemblies in the most convenient position for the operations performed. Parts and materials racks for this line are in the center of the oblong space between the two long legs of the conveyor loop, thereby conserving floor space.

An overhead tramrail line having one carrier equipped with a floor-controlled electric hoist connects the power plant assembly line with the final plane assembly conveyor line. When ready for a power plant assembly, the mounting group moves the hoist to the end of the power plant line and lifts an assembly from its hanger. The hoist with its load then is moved to the fuselage line.

Carriers and hangers on the final assembly line are similar in principal to those used on the forward monocoque assembly feeder line. Cables supporting the hangers can be adjusted to raise, lower, or tilt the plane to suit the convenience of the assemblers and inspectors. Carriers and hangers on this conveyor line, as on the other lines, are designed to prevent swaying of the load, even though it may be unbalanced. Thus, a workman may move out into the inner wing of an assembly, and then back into the cockpit of the plane, without causing the plane to swing in the air. This is of particular importance where other persons may be working around the same ship. Approximately half way down the 740-ft. long main assembly line is a huge paint spray booth which screens the entire plane assembly, except for the outer wing units that are fitted later, and makes it possible to finish paint the ship while it still is in progress on the assembly conveyor.

Almost 15,000 individual parts, not including several hundred thousand small rivets, must be fabricated to accurate limits and carefully assembled together in proper order in the manufacture of a "Vengeance" dive bomber. This is being done on a mass production basis by several thousand persons who a little more than a year ago were shop clerks, waitresses, farmers, students, housewives, school teachers, and garage mechanics. Only a few of the employees now engaged in manufacturing these planes had previous experience in any type of metal-working plant before going to work on their present jobs.

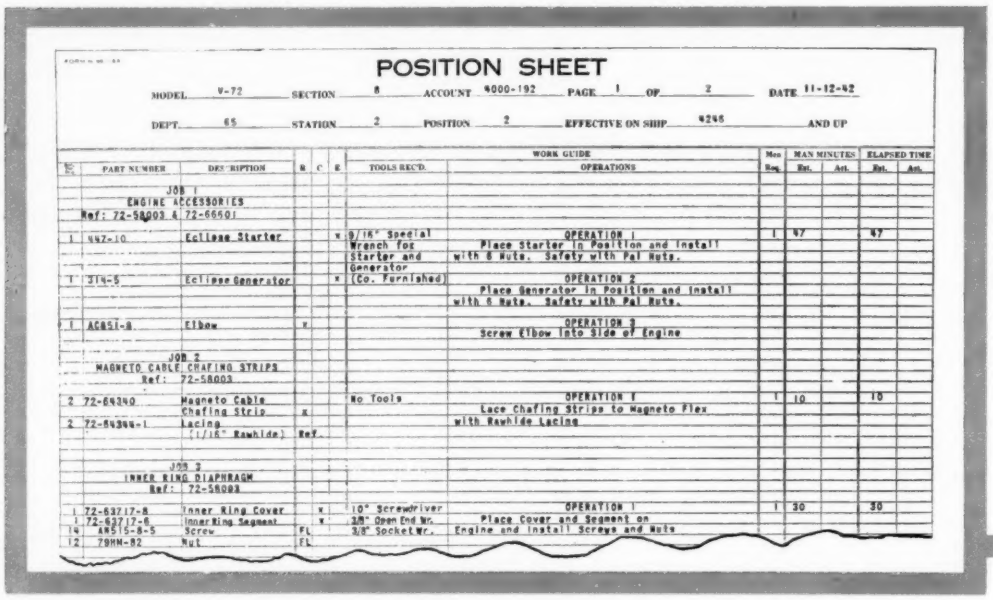
To offset this lack of manufacturing experience among the production personnel, the management instituted a practical training program for the shop supervisors and production employees, simplified manufacturing equipment and methods as much as possible, and developed a production control system that serves both as a means for scheduling the work through the shop and as a job instruction guide for inexperienced employees.

This control system includes issuing complete manufacturing instructions and working drawings (usually isometric sketches or marked photographs easily understood by the new employee not familiar with shop blueprints) for each order for parts or subassemblies, and the manufacture of such items for stock in quantities

required by the production schedule. The manufacturing instructions for making parts ordinarily are in the form of simple requisitions, while those for subassembly and final assembly work stations take the form of position specification sheets like the example shown.

The control system is based on a thorough analysis of each operation required for the production of the prototype plane and the first few production models. Design, production, methods and tool engineers examine the prototype carefully as it is being assembled in order to initiate design changes that will improve production without interfering with the performance of the plane in service, determine subassemblies that should be made up before mounting in the fuselage, and to make up a tentative list of subassembly and final assembly operations with a record of the time required for each operation.

From these data, man-time charts are prepared for each subassembly and final assembly station and tentative position sheets are made up. These are revised from time to time as improved methods are developed, or as engineering changes which require production line changes come through. When making up the man-time charts, the same amount of time must be allotted to each assembly station if the conveyor schedule is to be kept in balance and the work is to be moved according to schedule. Operations scheduled



POSITION SHEET

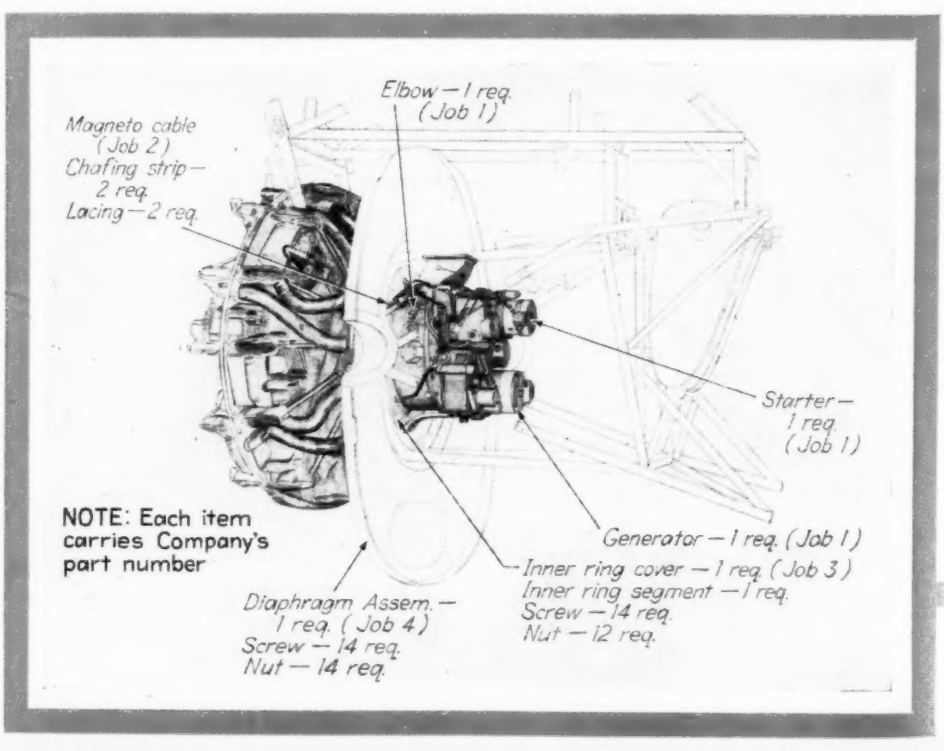
MODEL V-72 SECTION 8 ACCOUNT 4000-192 PAGE 1 OF 2 DATE 11-12-42

DEPT. 65 STATION 2 POSITION 2 EFFECTIVE ON SHIP 4245 AND UP

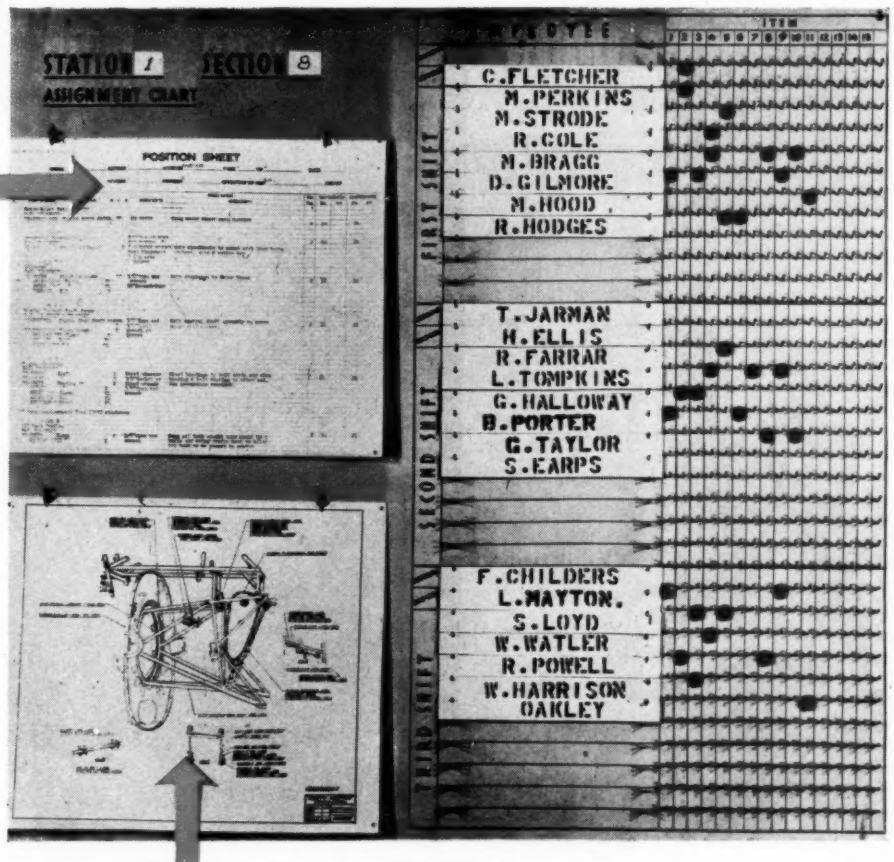
No.	PART NUMBER	DESCRIPTION	R	C	E	TOOLS REQ'D.	WORK GUIDE OPERATIONS	Nos Req.	MAN MINUTES Est.	MAN MINUTES Act.	ELAPSED TIME Est.	ELAPSED TIME Act.
		JOB 1 ENGINE ACCESSORIES Ref: 72-58003 & 72-66501										
1	447-10	Eclipse Starter			X	9/16" Special Wrench for Starter and Generator (Co. Furnished)	OPERATION 1 Place Starter in Position and Install with 6 Nuts. Safety with Pal Nuts.	1	47		47	
1	314-5	Eclipse Generator			X		OPERATION 2 Place Generator in Position and Install with 6 Nuts. Safety with Pal Nuts.					
1	AC45I-8	Elbow	X				OPERATION 3 Screw Elbow into Side of Engine					
		JOB 2 MAGNETO CABLE CHAFING STRIPS Ref: 72-58003										
2	72-64340	Magneto Cable Chafing Strip	X			No Tools	OPERATION 1 Lace Chafing Strips to Magneto Flex with Rawhide Lacing	1	10		10	
2	72-64344-1	Lacing (1/16" Rawhide)	Ref.									
		JOB 3 INNER RING DIAPHRAGM Ref: 72-58003										
1	72-63717-8	Inner Ring Cover			X	10" Screwdriver	OPERATION 1 Place Cover and Segment on Engine and Install Screws and Nuts	1	30		30	
1	72-63717-6	Inner Ring Segment			X	3/8" Open End Wr.						
14	AN515-8-5	Screw	FL			3/8" Socket Wr.						
12	78HM-82	Nut	FL									

Details of parts and tools required for each subassembly or assembly operation are shown on a "position" sheet prepared for each station. This data includes specific instructions for each operation and usually is accompanied by a prospective sketch or photograph showing the work to be done

Isometric or perspective sketches of subassemblies are readily understood by a new employee not familiar with shop blueprints and have the added advantage of showing units not ordinarily shown on aircraft engineering assembly drawings


Elbow — 1 req. (Job 1)
Magneto cable (Job 2)
Chafing strip — 2 req.
Lacing — 2 req.
Starter — 1 req. (Job 1)
Generator — 1 req. (Job 1)
Inner ring cover — 1 req. (Job 3)
Inner ring segment — 1 req.
Screw — 14 req.
Nut — 12 req.
Diaphragm Assem. — 1 req. (Job 4)
Screw — 14 req.
Nut — 14 req.
NOTE: Each item carries Company's part number

Position assignment charts are mounted on stands at each station along the final assembly line and the various feeder lines. Each chart shows the work to be done at that station and the employee who is responsible for it



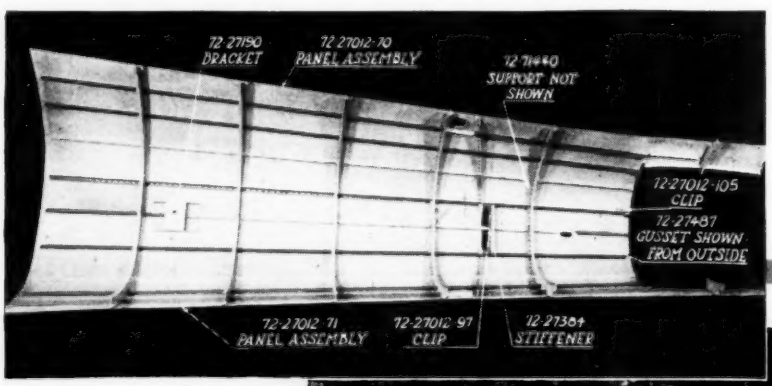
Assignment charts show on the left side the position sheet for the given station and a sketch or photograph of the work. The right side of the chart lists employees by shifts and indicates the jobs assigned to each man. These charts save much time for the supervisors, as they save countless questions ordinarily asked by a new employee

for each station must be selected so they can be done in the time allotted without the workers at that station interfering with each other. A study of the man-time chart shown as an example will indicate how various arrangements are worked out to insure certain operations being completed within the cycle time allowed. In some instances one or more men at a given station will spend all of the time on one operation. In others, the assembler will have several short jobs assigned to him—and these will be so scheduled as to limit his interference with others.

Design engineering is done by groups of specialists —fuselage, flight controls, hydraulic, electrical, landing gear, etc.—and drawings prepared by these groups do not indicate how parts and subassemblies developed by the different groups can be combined in subassemblies. Also, few of the production employees are familiar with projection drawings as made by the engineering department. For this reason, production drawings are made up for the shop by the production control department to replace or supplement engineering department drawings. These production drawings usually are isometric projection sketches readily understood by any shop worker.

With a position sheet before him to supply instructions regarding the work to be done, and with an isometric sketch or marked photograph to show how the various parts fit together, the average assembly worker does not need experience in blueprint reading or much attention from his supervisor in order to go ahead with the work he is to do.

A position sheet and an assembly sketch or photograph is posted at each subassembly station, and at each work station on each of the assembly conveyor lines. Also, every worker at one of these stations has a nameplate hung beside a numbered list of jobs to be done at his station which is keyed to the master position sheet. A glance at the red disks hung beside his name tells a worker what jobs he is expected to perform. Even if his supervisor is away from the work station, the worker can refer to these aids for help in determining what to do next.



Often a photograph of an assembly serves better than a perspective drawing in conveying information about an assembly operation. It has the added advantage of being relatively inexpensive to make

Photographs or perspective sketches aid the operators at each work station. They are permanently mounted near the work station for reference

TIME-DATA SHEET NO. 44

Radial Drill Press Operations—IX

Table No. 8—Time to Tap Cast and Cold or Hot Rolled Steel

Tap Size	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3
Thds. per In.	20	16	13	10	8	7	6	5	4 1/2	4 1/2	4	4	3 1/2
R.P.M.	318	184	131	88	70	55	38	33	28	25	23	21	19
Depth Tapped	Allowed time in decimal hours (includes lead of tap)												
1/8	0.0011	0.0014	0.0018	0.0022	0.0026	0.0031	0.0042	0.0046	0.0052	0.0059	0.0063	0.0068	0.0073
1/4	0.0014	0.0018	0.0022	0.0028	0.0031	0.0037	0.0049	0.0053	0.0060	0.0067	0.0071	0.0077	0.0082
3/8	0.0017	0.0023	0.0027	0.0033	0.0037	0.0043	0.0057	0.0061	0.0068	0.0076	0.0080	0.0087	0.0090
1/2	0.0020	0.0027	0.0032	0.0037	0.0043	0.0049	0.0064	0.0068	0.0075	0.0085	0.0088	0.0095	0.0099
5/8	0.0023	0.0031	0.0037	0.0044	0.0048	0.0052	0.0072	0.0076	0.0083	0.0093	0.0097	0.0105	0.0108
3/4	0.0026	0.0034	0.0041	0.0050	0.0054	0.0062	0.0079	0.0082	0.0091	0.0102	0.0105	0.0114	0.0117
7/8	0.0029	0.0039	0.0046	0.0055	0.0059	0.0063	0.0087	0.0090	0.0098	0.0110	0.0113	0.0123	0.0125
1	0.0032	0.0043	0.0051	0.0060	0.0065	0.0074	0.0094	0.0097	0.0106	0.0119	0.0121	0.0132	0.0134
1 1/8	0.0035	0.0047	0.0056	0.0066	0.0070	0.0080	0.0102	0.0104	0.0113	0.0128	0.0130	0.0141	0.0143
1 1/4	0.0038	0.0052	0.0060	0.0071	0.0076	0.0086	0.0109	0.0111	0.0121	0.0137	0.0138	0.0150	0.0152
1 3/8	0.0041	0.0056	0.0065	0.0076	0.0081	0.0092	0.0117	0.0119	0.0128	0.0145	0.0147	0.0155	0.0156
1 1/2	0.0044	0.0060	0.0070	0.0082	0.0088	0.0099	0.0124	0.0126	0.0136	0.0154	0.0155	0.0168	0.0169
1 3/4	0.0050	0.0068	0.0079	0.0093	0.0098	0.0111	0.0139	0.0140	0.0152	0.0171	0.0171	0.0187	0.0187
2	0.0056	0.0076	0.0089	0.0103	0.0108	0.0123	0.0154	0.0155	0.0167	0.0188	0.0188	0.0204	0.0204
2 1/4	.....	.....	0.0098	0.0114	0.0119	0.0135	0.0169	0.0169	0.0182	0.0206	0.0205	0.0223	0.0222
2 1/2	.....	.....	0.0108	0.0124	0.0130	0.0148	0.0184	0.0184	0.0197	0.0223	0.0222	0.0241	0.0240
2 3/4	.....	.....	.....	0.0136	0.0142	0.0160	0.0199	0.0198	0.0212	0.0240	0.0238	0.0260	0.0257
3	.....	.....	.....	0.0146	0.0152	0.0172	0.0214	0.0213	0.0228	0.0257	0.0255	0.0278	0.0274
3 1/4	.....	.....	.....	.....	.....	0.0184	0.0229	0.0227	0.0243	0.0274	0.0268	0.0296	0.0292
3 1/2	.....	.....	.....	.....	.....	0.0196	0.0245	0.0242	0.0258	0.0292	0.0288	0.0314	0.0309
3 3/4	.....	.....	.....	.....	.....	.....	.....	.....	0.0274	0.0309	0.0305	0.0332	0.0327
4	.....	.....	.....	.....	.....	.....	.....	.....	0.0289	0.0326	0.0322	0.0350	0.0352
4 1/4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.0368	0.0362
4 1/2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.0386	0.0379
4 3/4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.0405	0.0396
5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.0424	0.0414
Per Inch	0.0024	0.0033	0.0038	0.0043	0.0044	0.0049	0.0060	0.0058	0.0061	0.0069	0.0067	0.0073	0.0070

Table No. 9—Time to Tap Bronze Alloys

Tap Size	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3
Thds. per In.	20	16	13	10	8	7	6	5	4 1/2	4 1/2	4	4	3 1/2
R.P.M.	455	308	229	153	115	92	71	61	53	48	43	39	36
Depth Tapped	Allowed time in decimal hours (includes lead of tap)												
1/8	0.0009	0.0010	0.0013	0.0015	0.0018	0.0020	0.0024	0.0026	0.0029	0.0033	0.0036	0.0038	0.0040
1/4	0.0011	0.0013	0.0015	0.0018	0.0021	0.0024	0.0028	0.0030	0.0033	0.0037	0.0040	0.0043	0.0045
3/8	0.0013	0.0015	0.0017	0.0021	0.0024	0.0027	0.0032	0.0034	0.0037	0.0041	0.0045	0.0048	0.0050
1/2	0.0015	0.0018	0.0020	0.0024	0.0028	0.0031	0.0036	0.0038	0.0042	0.0046	0.0049	0.0053	0.0055
5/8	0.0017	0.0020	0.0023	0.0027	0.0031	0.0035	0.0040	0.0042	0.0045	0.0051	0.0054	0.0058	0.0059
3/4	0.0019	0.0023	0.0026	0.0031	0.0035	0.0038	0.0044	0.0046	0.0050	0.0055	0.0058	0.0063	0.0063
7/8	0.0022	0.0025	0.0028	0.0034	0.0038	0.0042	0.0048	0.0050	0.0053	0.0059	0.0063	0.0068	0.0068
1	0.0024	0.0027	0.0031	0.0037	0.0041	0.0046	0.0052	0.0054	0.0058	0.0064	0.0067	0.0072	0.0073
1 1/8	0.0026	0.0030	0.0034	0.0040	0.0045	0.0049	0.0056	0.0058	0.0061	0.0068	0.0072	0.0077	0.0077
1 1/4	0.0028	0.0033	0.0037	0.0043	0.0047	0.0053	0.0060	0.0061	0.0066	0.0073	0.0076	0.0082	0.0082
1 3/8	0.0030	0.0035	0.0039	0.0046	0.0051	0.0056	0.0064	0.0065	0.0069	0.0077	0.0081	0.0087	0.0087
1 1/2	0.0032	0.0038	0.0042	0.0049	0.0055	0.0060	0.0068	0.0069	0.0073	0.0082	0.0085	0.0092	0.0091
1 3/4	0.0036	0.0043	0.0048	0.0056	0.0062	0.0067	0.0076	0.0077	0.0082	0.0091	0.0094	0.0102	0.0101
2	0.0041	0.0048	0.0053	0.0062	0.0068	0.0075	0.0084	0.0085	0.0089	0.0100	0.0104	0.0111	0.0110
2 1/4	.....	.....	0.0059	0.0069	0.0075	0.0082	0.0092	0.0094	0.0098	0.0109	0.0112	0.0121	0.0119
2 1/2	.....	.....	0.0064	0.0074	0.0082	0.0089	0.0100	0.0100	0.0105	0.0118	0.0121	0.0131	0.0128
2 3/4	.....	.....	.....	0.0081	0.0089	0.0096	0.0108	0.0108	0.0113	0.0127	0.0130	0.0141	0.0137
3	.....	.....	.....	0.0087	0.0095	0.0104	0.0116	0.0116	0.0121	0.0136	0.0139	0.0150	0.0147
3 1/4	.....	.....	.....	.....	.....	0.0111	0.0124	0.0123	0.0129	0.0145	0.0149	0.0156	0.0156
3 1/2	.....	.....	.....	.....	.....	0.0118	0.0132	0.0131	0.0137	0.0154	0.0157	0.0170	0.0165
3 3/4	.....	.....	.....	.....	.....	.....	.....	.....	0.0145	0.0163	0.0166	0.0176	0.0175
4	.....	.....	.....	.....	.....	.....	.....	.....	0.0153	0.0172	0.0175	0.0185	0.0188
4 1/4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.0199	0.0194
4 1/2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.0209	0.0202
4 3/4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.0219	0.0212
5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.0228	0.0221
Per Inch	0.0017	0.0020	0.0022	0.0025	0.0027	0.0029	0.0032	0.0031	0.0032	0.0036	0.0036	0.0039	0.0037

NOW! Twice the Range–Longer Life

and no Increase in Cost...Webber Gage Blocks No. 84A

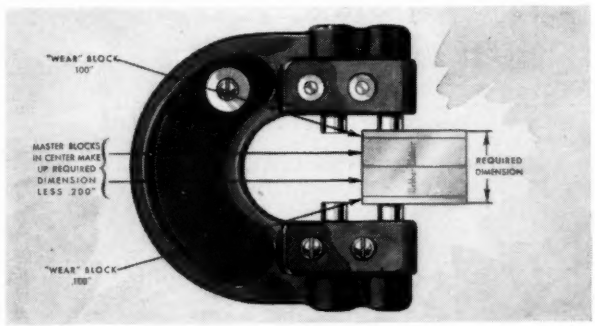
● To help meet greatly increased wartime demands on the accuracy and life of precision gage blocks Webber Gage Co. announces that effective immediately every 81 A set of Webber Gages will contain three new blocks which will double the measuring range and greatly prolong the life of the set. One of these is a new block permitting measurements of one half of one ten thousandth of an inch. The other two blocks are "wear" blocks. (.100 inch)

Normally all measurements with gage blocks are made in steps of .0001". With the addition of this new block, .10005", you can now make measurements in steps of one half of one ten thousandths of an inch.

Previously about 125,000 size combinations were possible with an 81 A Set of Webber Gage Blocks. This new .10005 inch block *doubles* this range permitting about 250,000 size combinations.

The two new .100 inch "wear" blocks have been added to save unnecessary wear to the rest of the blocks in the set. An example of the use of "wear" blocks is shown in the illustration at right of setting an adjustable snap gage. Here the blocks are all wrung together and the master blocks being in the middle are protected by the "wear" blocks on which you always expose the same surface to the work. The wear is always on the wear blocks preserving your master blocks, assuring continued accuracy.

Thus Webber Gage Company have increased the utility of their gage blocks by doubling the range–has added greatly to the life of the set with the two "wear" blocks–and the cost of the set is just the same as always. The new set will be known as No. 84 A . . . Write for full information.



Webber
GAGE COMPANY
12911 TRISKETT RD., CLEVELAND, OHIO

●

For the duration Webber's entire productive capacity is being devoted to the manufacture of GRADE A BLOCKS only.

●

Prompt delivery to firms furnishing necessary priorities. Prices for Set 84 A—$350.00. Set 40 A—$185.00.

●

Notice: The new 84 A sets have been in production and all deliveries made on or after March 6 are of this new set.

TIME-DATA SHEET NO. 45

Radial Drill Press Operations—X

Operation Symbol	Description of Operation	Allowed Time Std. Hours
	Each Piece Operations	
	(Applicable to all parts in vise, fixture or table.)	
K_3	Place chuck or tool in spindle	0.0047
L_3	Remove chuck or tool from spindle	0.0054
M_3	Get and place tool in drill chuck (drill, reamer, counterbore or tap)	0.0025
N_3	Remove tool from drill chuck (drill, reamer, counterbore or tap)	0.0020
P_3	Reverse spindle with clutch lever	0.0004
Q_3	Move arm to work	0.0062
R_3	Move arm to first hole, raise and lower spindle, engage feed	
S_3	Move arm from hole to hole, raise and lower spindle, engage feed (small and medium parts)	0.0030
T_3	Move arm from work	0.0028
U_3	Raise arm on column	0.0054
V_3	Lower arm on column	0.0042
W_3	Burr tapped hole	0.0024
X_3	Lubricate tap (brush with white lead or oil)	0.0018
Y_3	Set dial for depth	0.0048
Z_3	Blow out hole before tapping (blind hole only)	0.0008
A_4	Blow out hole after tapping (blind hole only)	0.0007
B_4	Check with thread gage (large pipe tap)	0.0088
C_4	Locate and spot drill from layout	0.0044
D_4	Place keyed chuck or tool in spindle (insert and drive in key)	0.0127
E_4	Remove keyed chuck or tool from spindle (remove key)	0.0093
	Each Piece Operations	
	(Applicable to parts held in jig.)	
F_4	Clean and blow out small jig	0.0020
G_4	Clean and blow out medium jig	0.0028
H_4	Clean and blow out large jig	0.0035
J_4	Clean and blow out very large jig	0.0049
K_4	Turn over small jig by hand	0.0011
L_4	Turn over medium jig by hand	0.0019
M_4	Turn over large jig by hand	0.0026
P_4	Place small part (0.51 to 5.00 lb.) in jig or fixture	0.0021
Q_4	Place medium part (5.01 to 20.00 lb.) in jig or fixture	0.0036
R_4	Place large part (20.01 to 45.00 lb.) in jig or fixture	0.0060
S_4	Place very large part (45.01 to 75.00 lb.) in jig or fixture	0.0083
T_4	Place very large part (75.01 to 2,000 lb.) in jig or fixture with jib crane	0.0352
U_4	Place very large part (over 2,000 lb.) in jig or fixture with over-head crane	0.0450
V_4	Close lid on jig or fixture (hinged lid)	0.0005
W_4	Put lid on very large jig or fixture and adjust, using jib crane	0.0623
X_4	Put conjunction part of jig back in place	0.0098
Y_4	File burrs from finished surface	0.0101
Z_4	Tighten thumb screw or wing nut	0.0008
A_5	Tighten locating screw by hand	0.0023
B_5	Tighten locating screw with wrench	0.0035
C_5	Place and remove bushing, per hole	0.0021
D_5	Turn over very large jig by hand	0.0040

(To be continued)

Table No. 10—Time To Tap Copper

Tap Size	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3
Thds. per In.	20	16	13	10	8	7	6	5	4 1/2	4 1/2	4	4	3 1/2
R.P.M.	535	357	267	178	133	107	82	70	61	54	49	44	41
Depth Tapped	Allowed time in decimal hours (includes lead of tap)												
1/8	0.0008	0.0009	0.0011	0.0013	0.0016	0.0018	0.0022	0.0024	0.0026	0.0029	0.0031	0.0035	0.0037
1/4	0.0010	0.0012	0.0013	0.0016	0.0018	0.0021	0.0025	0.0027	0.0030	0.0033	0.0035	0.0039	0.0042
3/8	0.0011	0.0014	0.0016	0.0019	0.0021	0.0024	0.0029	0.0030	0.0033	0.0037	0.0039	0.0044	0.0046
1/2	0.0013	0.0016	0.0018	0.0022	0.0024	0.0027	0.0032	0.0034	0.0037	0.0041	0.0043	0.0048	0.0050
5/8	0.0015	0.0018	0.0020	0.0024	0.0027	0.0030	0.0036	0.0037	0.0040	0.0045	0.0047	0.0052	0.0054
3/4	0.0017	0.0020	0.0023	0.0027	0.0030	0.0034	0.0039	0.0040	0.0044	0.0050	0.0051	0.0057	0.0059
7/8	0.0018	0.0022	0.0025	0.0030	0.0033	0.0037	0.0043	0.0044	0.0047	0.0053	0.0055	0.0061	0.0063
1	0.0020	0.0024	0.0028	0.0033	0.0036	0.0040	0.0046	0.0047	0.0051	0.0058	0.0059	0.0065	0.0067
1 1/8	0.0022	0.0026	0.0030	0.0036	0.0039	0.0043	0.0050	0.0051	0.0054	0.0061	0.0062	0.0070	0.0071
1 1/4	0.0024	0.0029	0.0032	0.0038	0.0042	0.0046	0.0053	0.0054	0.0058	0.0066	0.0066	0.0074	0.0076
1 3/8	0.0026	0.0031	0.0035	0.0041	0.0044	0.0049	0.0057	0.0058	0.0061	0.0069	0.0070	0.0079	0.0080
1 1/2	0.0027	0.0033	0.0037	0.0044	0.0047	0.0052	0.0060	0.0061	0.0065	0.0074	0.0074	0.0083	0.0084
1 3/4	0.0031	0.0037	0.0042	0.0049	0.0053	0.0059	0.0067	0.0068	0.0072	0.0081	0.0082	0.0092	0.0093
2	0.0034	0.0041	0.0046	0.0055	0.0059	0.0065	0.0074	0.0074	0.0079	0.0090	0.0089	0.0100	0.0101
2 1/4	.....	.....	0.0051	0.0060	0.0065	0.0071	0.0081	0.0081	0.0086	0.0098	0.0097	0.0109	0.0110
2 1/2	.....	.....	0.0056	0.0066	0.0070	0.0077	0.0088	0.0088	0.0093	0.0105	0.0105	0.0118	0.0118
2 3/4	.....	.....	.....	0.0071	0.0076	0.0084	0.0095	0.0095	0.0100	0.0114	0.0112	0.0126	0.0127
3	.....	.....	.....	0.0077	0.0082	0.0090	0.0102	0.0101	0.0107	0.0121	0.0120	0.0135	0.0135
3 1/4	.....	.....	.....	.....	.....	0.0096	0.0109	0.0108	0.0114	0.0129	0.0128	0.0144	0.0144
3 1/2	.....	.....	.....	.....	.....	0.0102	0.0116	0.0115	0.0121	0.0137	0.0135	0.0153	0.0152
3 3/4	.....	.....	.....	.....	.....	.....	.....	.....	0.0127	0.0145	0.0143	0.0162	0.0161
4	.....	.....	.....	.....	.....	.....	.....	.....	0.0134	0.0153	0.0151	0.0170	0.0173
4 1/4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.0179	0.0178
4 1/2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.0188	0.0186
4 3/4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.0196	0.0194
5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.0205	0.0203
Per Inch	0.0014	0.0017	0.0019	0.0022	0.0023	0.0025	0.0028	0.0027	0.0028	0.0032	0.0031	0.0035	0.0034

NEW HEAVY TOOLS GIVE MORE RIGIDITY AND GREATER RANGE TO

CINCINNATI ACME TURRET LATHES

● Acme Machine Tool Co. have developed a NEW LINE of MASSIVE TOOL HEADS AND HOLDERS. These meet today's demands for power—high speed and accuracy imposed by carbide tool steels.

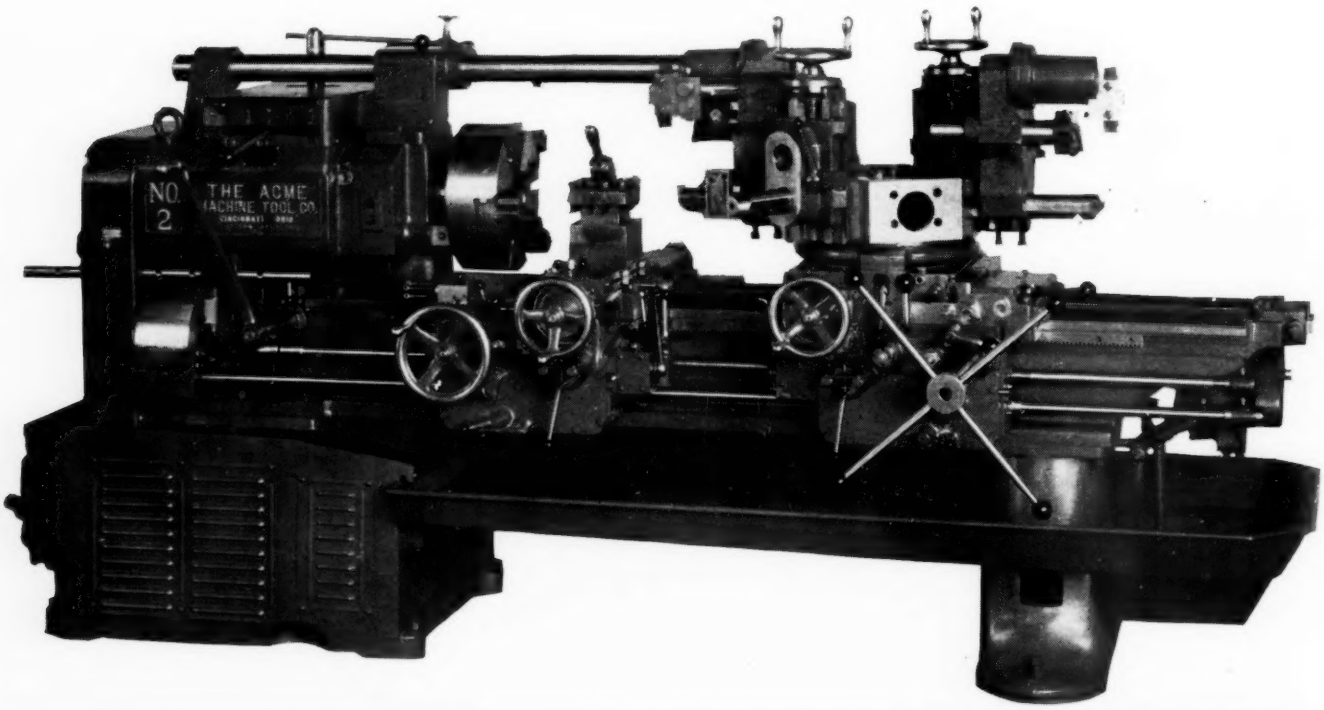
The head at the left is the adjustable multiple turning head with guide bushing which takes its support on a rigid heavy stationary bar mounted on headstock.

At the extreme right is shown the standard heavy duty multiple turning head without the adjustable feature, but with fixed center holes for holding the cutter heads.

A variety of tool holders are also shown. These are straight and angular types, also an adjustable type for the fixed center type head. These have also been made heavier throughout and provided with cutting tools of very heavy cross sections.

Acme Turret Lathes are made in bar capacities from 2" to 4½" diameter and in chuck capacities from 20" to 28" swing.

OUR ENGINEERS ARE AT YOUR SERVICE.



The ACME MACHINE TOOL CO.. ... CINCINNATI, OHIO.

Wichita City Library

Renegotiation Takes the Prize

IT IS TIME to debunk renegotiation, because it is far from being what its advocates claim.

Take savings to the government. Most of it would come back to Uncle Sam anyway in excess profits taxes. To be specific, some eight hundred thousand out of every million dollars would be recovered in that way, regardless of renegotiation.

When we started making war goods and had no experience with them, prices were set mostly by guesswork. As we gained "know-how" and costs came down, many contractors voluntarily reduced prices and returned excess profits.

Price adjustment boards should not get credit for the sweeping savings claimed by certain spokesmen, but only for the sums which they are instrumental in securing and which otherwise would not be returned to the Treasury.

Renegotiation is a bedeviling experience. It operates by no fixed formula. It has no printed regulations. It is surrounded by indecision, secrecy and vagueness. The manufacturer is on the hot seat constantly until his own renegotiation is completed, because there is no precedent to guide him (all precedents having been tossed aside).

Even when the process is completed, he is still in the dark. Results are not uniform. They vary with the opinions of different local boards. Moreover, there is no assurance that Washington will accept a local board's decisions.

Renegotiation robs manufacturers of any incentive to reduce costs or to strive for greater efficiency. Sums recovered from more efficient units are sure to be greater than those recovered from less efficient units.

The task of renegotiation, as it now stands, is so vast and complex that price adjustment boards have scarcely made a start.

The individual company meanwhile hovers in a state of anxiety and indecision, not knowing what its actual earnings were in 1942 and *not being able to make its plans intelligently for the future.*

If it plows back sizable sums, and wisely, into its business to do a better job and to strengthen its position, how much will it be penalized by renegotiation?

If it is a durable goods producer dependent upon building up reserves to survive in the lean years later on, how much will it be permitted to keep for such purposes?

Answers to these and other vital questions involved in renegotiation are formulated through the opinions and prejudices of officials working behind closed doors who are not elected to their posts.

As an example of legislation which has about it the odor of political opportunism and which sets out to catch a guilty few and in so doing penalizes everybody else, renegotiation takes the prize.

Should we wish to prevent profiteering, there are other and better ways of doing it. If we must have renegotiation, at least let's restrict it to prime contractors and not try to apply it all over the map where it does far more harm than good.

Burnham Finney

GAGING BUSINESS

Conversion of tool builders to production items is coming on apace, as orders backlog lessens. Government-encouraged unions now promise to embarrass it. Wage incentive and bonus systems are considered. Raw material production pushed

Tool Order Trend Downward Volume of machine tool orders for some companies is still on a level with production, but that is not true of the industry as a whole. Output in March is believed to have continued a downward trend which began in January. Further shrinkage in new business and in monthly production appears inevitable as the year progresses. Many machine tool builders continue to have six to eight months' backlog, but offsetting that are others who can make relatively short deliveries.

Conversion to Accompany Cut The industry is convinced that production late this year will be stabilized on a plateau substantially below the December peak but two or three times the volume attained in the best peacetime year. For 1943 as a whole, machine tool output still promises to total close to one billion dollars. The gradual paring of operations does not necessarily mean reduced employment by machine tool builders but rather a cutting off of some subcontractors and the drawing of outside work into builders' own plants.

Increasing attention is being given to the use of spare facilities in machine tool plants for the manufacture of other war goods. One company, for example, will begin shortly to make steam turbines for submarine chasers and escort ships. At least one other prominent builder has figured on subcontract items for Packard's expanded Rolls-Royce program.

Franklin's Frankenstein Some time in the next 30 days, the Administration must decide what to do about labor's demand that the Little Steel wage formula be scrapped. The situation is brought to a head not by the constant pressure of A.F.L.'s Green and C.I.O.'s Murray, who have joined forces on the issue, but by John L. Lewis. The agreement reached between the coal operators and Lewis continues production for one month while the government attempts to figure a face-saving out.

Lewis Lays The Lash This time Lewis is top dog. According to high A.F.L. and C.I.O. officials who hate his viscera, Lewis will call out the miners unless he gets substantially the wage increase demanded. And he can probably make his demands stick. For it is one thing to take over a large industrial plant with a show of military authority, but it is well-nigh impossible to put the Army in thousands of small collieries.

Lewis' strong trading position is especially hateful to other top labor leaders. Should he get the credit for breaking the Little Steel formula, they fear a revival of his influence among rank and file unionists.

Ire is Toward The President Both the C.I.O. and the A.F.L. will be more miffed with the President than ever, if he lets Lewis get away with his demands and turns them down on an easing of the Little Steel formula. But as one high labor leader says, "Who ever got him cornered."

Labor is getting set to accept some sort of incentive-wage system if the Administration really holds to existing wage policy. Murray's recent statement at Pittsburgh and Reuther's announcement at Detroit show the trend. Incentive-wage plans for the individual are not considered.

Bonuses May Solve Problem Payment of over-all bonuses on higher plant production may be the out that will be chosen by the Administration, since this idea appears acceptable to WPB, as well as the A.F.L. and C.I.O. For example, a plant that ups production from 300 to 400 units per day would give all employees a 33⅓ percent increase in wages. Lower unit costs resulting from the higher production would pacify Economic Stabilizer Byrnes, according to all concerned.

This over-all incentive-wage plan was recently installed in a midwest plant making critical war goods, at the suggestion of WPB. Results have been satisfactory to labor, management, the armed services and WPB. Adoption of the plan in one of the largest aircraft plants is under consideration, pending the probability that Lewis will breach the Little Steel formula.

Push Is On Raw Materials Pressure from WPB to increase output of raw materials is likely to be strong. Among unusual steps considered is production of aluminum from raw materials other than bauxite. Shortages of critical materials are being overcome without spectacular moves on the part of WPB. To overcome the lack of aluminum extrusions for the expanded aircraft program, a slight change in alloy to permit faster press working gave a five percent gain. Several additional percent were obtained from a reduction in minimum length of extrusion stock. Around 1,500 more planes will be produced in April as a result of the increase which has been made in aluminum extrusion output.

Apparently Down; Actually Up — War expenditures for February declined to $6,081,000,000, as compared to $6,254,000,000 for January. Actually there was a rise in per day expenditures, and February's shortness accounts for the contradictory appearance of the graph.

WPB Defends CMP Against Charges of Slowing Output

Practices against which the Automotive Council for War Production complained are explained by WPB as being prearranged tactical moves. Some minor changes result

BY ROBERT COLBORN

WASHINGTON—Just before the Controlled Materials Plan started actually distributing materials, April 1, the plan came in for its first barrage of serious criticism. The attacks came from the Automotive Council for War Production, which had run a survey of its membership to find out how they were set up to undertake operations under the plan. The council found its members jittery and worried. It gathered together their complaints and took them to Washington. Result was several minor changes in procedure and some explanations.

The auto men returned to Detroit somewhat eased in mind if still a little sceptical over the success of the plan in its first go-round in the second quarter.

Allotment Delay is Crux

Most immediately important of the auto-company objections related to delays in the issuance of allotments. A survey made by the Automotive Council revealed that at mid-March nearly a third of the firms in the Detroit area had not yet received their allotments. Subcontractors were, of course, in even worse shape. This, they feared, would interfere seriously with placement of material orders for April and May delivery—particularly orders for steel.

WPB admits allotments are late, thinks it's inescapable in a new plan. Third quarter allotments will be late too—though not, it's hoped, so very late. WPB however expects to overcome much of the immediate trouble by postponing until April 15 the application of CMP to deliveries of carbon steel.

No Delay for Alloys

On alloy steels, copper, and aluminum, WPB keeps a close enough watch over shipments so that the delays shouldn't cause serious trouble. WPB can ensure, for instance, that an order placed under the Production Requirements Plan by an important firm not under CMP during the transitional second quarter isn't put at the bottom of the pile.

On the big volume of carbon steel no such close control is possible, but by April 15, the steel mills should have all the CMP allotments and PRP priority orders in front of them and can schedule their runs intelligently.

Allotments Not Balanced

The second auto-company complaint is that some companies—about 10 percent—are getting unbalanced allotments—i.e. are getting, say, all the steel they need but only part of the aluminum. WPB answer to this one was an explanation. Sometimes, when this happened, it meant that the claimant agency suspected the manufacturer of having concealed inventories and was trying to force them out.

More often, it reflected an actual unbalance in the supply of materials. Admittedly, in such a situation, the theoretically correct thing to do is to cut the production schedule to match the scarcest material, redistribute the other materials. It was thought, however, that if the schedules were maintained manufacturers might exert their ingenuity and find some way of getting along with less material.

Unbalances Are Tolerated

A further factor in unbalanced allotments was a temporary scarcity of aluminum castings at the time the allotments were made. Rather than cut production schedules, the agencies preferred to tolerate unbalance, correcting it later when—as has now happened—the shortage was cleared up by an arrangement with the British.

Most of the auto men were satisfied with the explanation, though some retained a suspicion that the claimant agencies had simply slumped into PRP methods of allocation.

Split Ratings Defended

WPB had no apologies when the Detroiters complained of split ratings—under which a firm will get an AA-1 on, say, 90 percent of its uncontrolled materials and an AA-3 on the other 10 percent. This, it was explained, arose out of the basic assumption of CMP—that if production schedules were held to the level permitted by the supply of the three controlled materials, there will be enough of the uncontrolled materials.

This, said WPB, is still an assumption. It might be wrong. If it is, we don't want to end up with full deliveries of some items, practically none of others. We'd rather have 90 percent of everything. The split rating ensures that any scarcities which show up will be spread over the tail end of everyone's production rather than concentrated on some items.

Smaller Caliber Shells Are Now Being Made from Steel

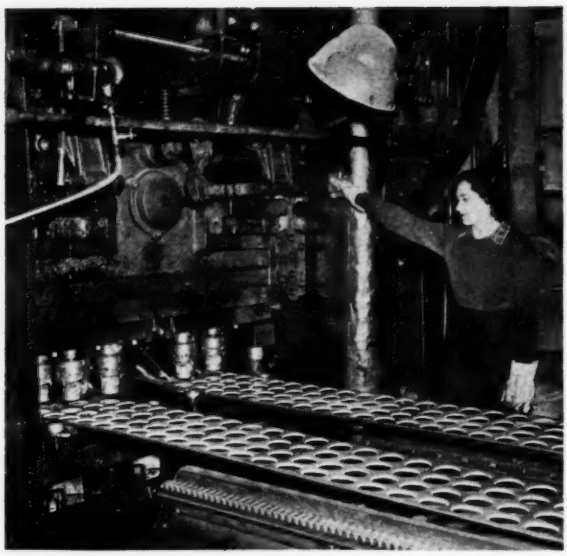
WASHINGTON—The Army announces perfection of a process and initial production of 45 caliber ammunition from steel instead of brass. The saving in brass amounts to 1,774 pounds per each 100,000 rounds. This is a substantial copper saving, but the bulk of small arms ammunition is 30 caliber for rifles and ground and airplane machine guns and 50 caliber for ground and aerial machine guns.

It is known that 50 caliber ammunition of steel are being produced, but whether for ground or aircraft use is not known; experts say that the longer draw is much more difficult. Ordnance officials have nothing to say on this subject at this time.

The hardest problem of all is to make aircraft machine gun ammunition of steel; a jammed gun during aerial combat is a serious matter. Perfection of the 45 caliber process is credited by Secretary of War Stimson to the Evansville Ordnance Plant, Evansville, Ind. Steel shells have been in volume production for months in artillery sizes—20 millimeters and up.

Pro and Con—M-4 tanks (r.) and M-10 tank destroyers (l.) move toward completion on parallel assembly lines at the Grand Blanc, Mich., tank arsenal of the Fisher Body Division of General Motors. The M-10 turrets are open-topped, but have been retouched here so as not to disclose armament details

Press Ass'n.



Like Father Used to Make—A punch machine operated by a girl at the Gary Works of Carnegie - Illinois Steel Corp. cuts steel discs for 75-mm. shell cases. The plant has a steel output almost equal to that of the entire steel industry of Japan and nearly twice that of Italy

Acme

"ROUTE OUT SLACKER TOOLS!"

CINCINNATI—Thousands of perishable tools lying idle in factory tool bins because of contract completion, curtailment, or design change, represent many priceless man hours of highly skilled workmanship and tons of important strategic materials, according to Arthur C. Pletz, chairman, Cutting Tool Panel, Cincinnati Ordnance District. Mr. Pletz has issued an appeal to all producers to "Dig out the surplus tools in your plant, no matter how insignificant they seem, and report them to the Ordnance District Office in your locality."

In many instances important war production is being delayed for lack of the very tools held as surplus by other producers, he says. While many manufacturers have taken steps to put their surplus tools back into action, the stocks offered represent but a fraction of those remaining idle.

Expect Lower Price Ceiling for Used Machine Tools

WASHINGTON—A table of equivalent values is being formulated by the Office of Price Administration to lower the ceiling prices of used machine tools, at the same time widening the margin between "as is" tools and reconditioned tools.

But any reports as to the actual percentages of contemplated cuts in the ceiling cannot be taken as factual, because OPA officials themselves still do not know. They have been holding conferences with the industry in an effort to arrive at equitable figures.

Encourages Reconditioning

OPA has spread the margin between as-is equipment in other lines, and spokesmen tell this writer such action most likely will be taken on machine tools. The object of course is to encourage reconditioning. Other lines so treated were automobiles, farm equipment, and seven or eight others.

Some dealers admit that present used machine tool prices are higher in some cases than the price of equivalent new machines, but they say this is because there is no definite basis for determining which recent models shall be used as reference points. Whatever table of equivalent values is worked out by OPA will take care of this discrepancy.

Emphasize Free Competition in Postwar Economic Setup

NEW YORK—Free competition in manufacturing, distribution, labor and agriculture are essential to domestic well-being and progress, according to a just-released report by the Postwar Committee of the National Association of Manufacturers.

"Prosperity can be attained however, only if every section of the country, every part of our economic and social organization, and all of us as individuals work together and each expects in return only that share in such prosperity which is commensurate with his contribution," the report says.

Tool Engineering Handbook To Be Published by A.S.T.E.

DETROIT—A tool engineering handbook is to be published by the American Society of Tool Engineers, as soon as material can be gathered from the members of that organization, according to an announcement by President Otto Winter.

A survey of all available textbooks on various phases of tool engineering has revealed an inadequacy of information for the training and daily work of tool engineers. Mr. Winter ascribed this condition to the comparatively recent evolution of the profession of tool engineering, and the fact that most tool engineers have been self-taught.

As rapidly as data can be gathered from the approximately 12,000 members of A.S.T.E., stated Mr. Winter, it will be placed in final form and published when ready, rather than await final compilation of the handbook. Thus it will be possible gradually to compile the handbook while continuously supplying industry with up-to-date authoritative information on good tool engineering practice.

Order Puts Measuring and Testing Machines Under One Production, Distribution Control

WASHINGTON—Closer control over production and distribution of precision measuring instruments and testing machines is established by order E-9, issued recently by WPB's director general of operations.

Previously, some of the instruments were covered by E-1-b while E-5 covered gages, precision measuring tools, testing instruments, and chucks. Order E-9 was promulgated to bring these non-machine tool items under a single control. (Machine tools are defined as non-portable power driven, metal working machines.)

E-9 covers balancing machines, bench centers, comparators, dividing machines, gaging machines, hardware testers, light wave measuring instruments and devices, measuring machines, physical testing machines, super micrometers, surface measuring instruments, toolmakers microscopes—twelve items in all.

Under the terms of E-9 acceptance of purchase orders is restricted to those assigned ratings of A-1-a or higher by specified preference rating certificates, copies of which must be supplied to the producers. If requested by the director general of operations, manufacturers must file notification of all unfilled orders and proposed delivery schedules on form PD-669, with data concerning shipments and changes in orders previously reported, on form PD-670.

Delivery schedules are frozen for 60 days prior to the scheduled delivery dates, as in the case of E-1-b, unless the DGO directs otherwise. The DGO can change delivery schedules, allocate orders to other producers, or direct the delivery of any item covered by the order to a person other than the original purchaser, just as he can under E-1-b.

Short Strikes Over Small Incidents Become Widespread

Industry and the armed services are worried over a rash of little strikes set off by happenings in individual plants. Friction over use of Negro labor seems promoted

INSIDE DETROIT By Siler Freeman

DETROIT—Sporadic labor stoppages in the various Detroit war plants still indicate that the home front has not won its all-out battle for production peaks. It is not one plant here and there that is suffering the brunt of attack from unknown forces but a general condition that has the industry and the armed services worried.

Dodge has been one of the most consistent sufferers and the resignation of W. J. O'Neil as president of the division and the appointment of Herman Weckler, general manager of Chrysler and a veteran labor relations expert, may have some connection. O'Neil's sudden action went unexplained in Chrysler's announcement of the changes in the Dodge organization. It may have something to do with the slowness of the huge airplane engine plant in Chicago in getting under way but the more plausible explanation lies somewhere in the frequent troubles in the truck plant here.

Fight, Then Walkout

Ford has just experienced its worst labor trouble in some time, growing out of a brush between a guard at the River Rouge aviation engine plant and a UAW-CIO steward. Eight thousand men were affected by the dispute for a few hours.

The trouble began when the steward, employed days, tried to get into the aircraft plant at night without credentials. The guard refused him entrance and fists began to fly. The guard was victorious for the moment but fellow unionists came to the rescue of the steward and a free-for-all resulted in which the guard lost this time.

The investigation of the brawl by the company resulted in the suspension of three unionists and the walkout followed. Through the urgings of the Ford local chiefs and Col. George E. Strong of the Army Air Forces work was resumed later in the day but valuable time had already been lost.

Colonel Strong is investigating the walkout thoroughly and has promised to bring some concrete findings shortly. The newspapers have taken up the cry to find out who is promoting these stoppages over small incidents. It may get results but past experience has been contrary.

Hiring Negroes Caused Trouble

Packard, where labor relations have been more tranquil than any other plant in the area, is having its share of troubles. Theirs is typical of the entire industry and stems from the employment of more and more Negro workers, especially women. George T. Christopher, president of Packard, attempted infiltration tactics to make the colored workers acceptable to their white compatriots but admits he has been stopped. He is now considering an all-out move for a showdown, fears it may prove costly to production.

Christopher started filtering in colored women by taking them into the training school. There was little opposition there. Then he put them to work in new departments, working alongside of whites who had never been in the factory before. This went off well too.

Infiltration Tactics Failed

But then they were sent into departments with all old employees, working on machines. Then the trouble started. The whites refused to work with them, demanded separate toilet facilities, etc.

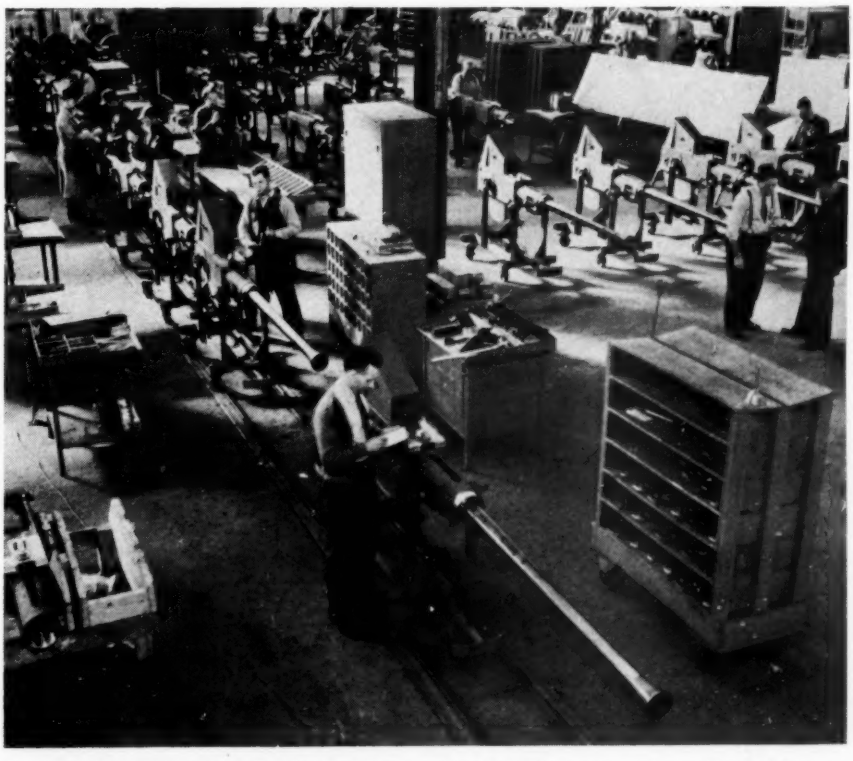
A compromise was reached on the facilities, the colored workers told to use toilets on another floor. They did for one day, came in the next and refused, saying this was discrimination. The fine hand of Negro leaders was seen in this move.

Christopher believes the time for pussyfoot tactics on this phase is over, direct action is next. But he anticipates much trouble. The international union leaders have been called in to discuss the matter and have instructed the stewards to cooperate with management in seeing that there is no trouble. Dismissal of stewards unable to control their departments is promised. But Christopher has little faith in this.

Packard is only typical of this new trouble. Other plants have had similar outbursts over the influx of Negro workers. Willow Run, where many of them are now employed and where thousands more will be taken in, is another hot spot. There have been frequent outbursts, causing lost time.

Employment Little Better

The employment situation at the bomber plant has shown little improvement since the War Manpower Commission took over the responsibility of adding 30,000 to the minimum figure needed to bring production up to Air



As the Caissons Go Rolling Along—Forty millimeter automatic field guns on the assembly line in a Pontiac Motor Division plant. Production of these guns, together with the 20-mm. Oerlikon anti-aircraft cannon, make Pontiac Motor the largest producer of heavy anti-aircraft weapons in the United States

Force requirements. Several meetings, between state, federal and municipal officials have brought hope but little else.

Raymond Foley, head of the FHA here, said that housing for the first time was ahead of employment, that there was sufficient on hand to meet all needs up to June. A canvass by Ypsilanti and Ann Arbor officials has shown added facilities to house 4,000 more.

But there is still a wrangle among federal housing agencies on what should be done and who will do it. There has been no disposition shown on the part of workers to gamble on what will be done for them if they accept jobs at Willow Run. Many there now are still intent on going back home because of poor housing and recreational facilities. The turnover in employment there has shown little change and is still alarming to both Ford officials and the Army.

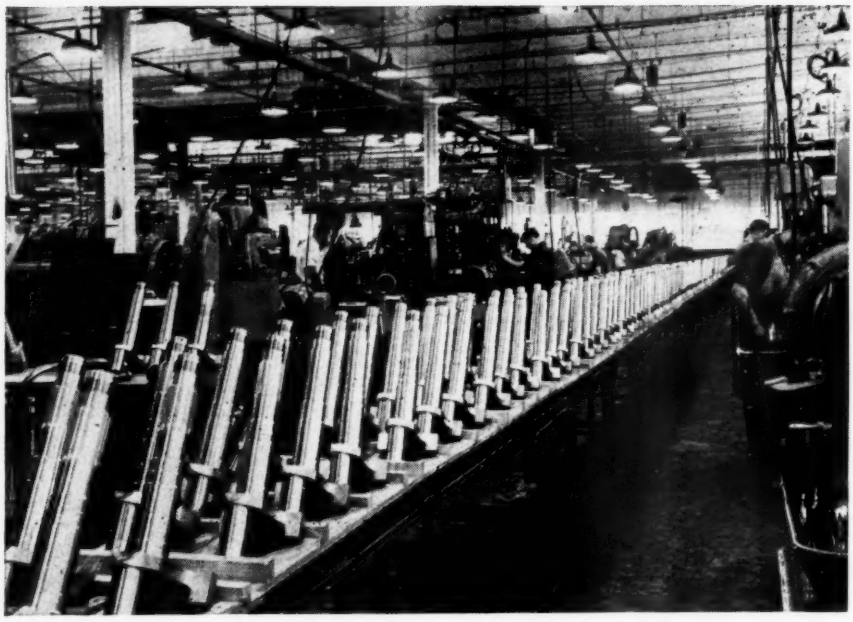
Central Council Formed

Following the lead of the two coast aircraft manufacturers groups, plane builders in the Central states have grouped themselves into an Aircraft Council to trade information, materials and production ideas to speed output of planes and parts. Ernest R. Breech of Bendix Aviation is chairman of the Council and representatives from all the larger companies are on the nine-man governing board.

The unique part of the new organization is that it not only takes in the aircraft manufacturers but those who build parts and accessories. The group is split into those three sections with each represented on the ruling body.

The Central Aircraft Council was formed with the blessings of the Army Air Forces and Wright Field, who wanted a single unit to take up its problems. The headquarters will be in Detroit and it will be affiliated closely with the Automotive Council for War Production. In fact, the automotive group will transfer members holding prime aircraft contracts to the new organization.

The Council will be divided into airframe manufacturers, engine builders and those who make propellors, carburetors, landing gears and other accessories.



Trainer Shafts—Crankshafts for 300 hp. Lycoming radial airplane engines move along a roller-conveyor line at The Aviation Corporation's Lycoming Division plant. Every pair of these shafts means power for another twin-engine Army advanced training plane

Cutting Tool Situation Is Serious; More Care Needed

WASHINGTON—Production of cutting tools is four months behind schedule and losses due to mishandling by inexperienced workers are serious, says George Johnson, director of the Tools Division of the War Production Board.

Calling attention to the fact that about 10,000,000 workers, many of them novices, are now using cutting tools, Mr. Johnson calls upon managements to teach them good shop practices as rapidly as possible. If this can be done, he estimates 10 percent of losses will be stopped.

Rules which are followed by experienced workmen include changing tool bits before they get too dull; using guides to locate jig-holes; keeping spacing collars clean and parallel; and above all putting tools away carefully.

Mr. Johnson stated that production of cutting tools in 1942 totaled $400 million and that it will have to be increased to $500 million in 1943. The most commonly used cutting tools are milling cutters, twist drills, taps, reamers, broachers and cemented carbide tipped tools.

"We must get across to the workers the fundamental idea that tools are war weapons and that they must be as well cared for as guns," he said.

Request ASA Establish War Standard on Cylindrical Fits

DETROIT—The Automotive Council for War Production, representing more than 500 industrial concerns, has asked the American Standards Association and the War Production Board for the establishment of an American War Standard for Cylindrical Fits, including specifications for gagemaker's tolerances and permissible gage wear, to be developed as soon as possible. This means the revision of the Tentative American Standard Tolerances, Allowances, and Gages for Metal Fits (B4a-1925) by an ASA War Committee and the addition of gage specifications to such a revised standard.

Need Visualized

The request came as the result of a meeting at the offices of the Automotive Council for War Production. The initial statement of the problem was made at the meeting by one of the representatives of the inspection department of a firm engaged in the manufacture of an airplane engine. In this instance, the requirement of making more than 40,000 inspections per engine and maintaining in use at all time about 100,000 gages, necessitated periodic checking of gages at a rate of 5,000 per day. Search for a general standard specifying what tolerances should be given the gage-maker in the manufacture of these gages, how these gage-maker's tolerances should be located relative to the limits of the part, and to what extent the gages should be permitted to wear, had revealed that no such American Standard is in existence.

Interchangeability Stressed

In the letter from the Automotive Council, George Romney, its managing director, said in part:

"Need for a workable standard in this field is emphasized by the fact that such a standard would help materially to eliminate problems that are now incurred in the inspection of parts made by subcontractors, would increase assurance of interchangeability of such parts, and would result in closer adherence by the shop to engineering specifications of tolerances and fits."

Gaging Inspection

Without a uniform system of gaging inspection, like components produced by differeint manufacturers may lack interchangeability because each company has used a different method to translate the parts limits on the drawings into gage specifications.

WARTIME WASHINGTON

BY BLAINE STUBBLEFIELD

Renegotiation of machine tool contracts has been a slow process, due to arguments that the industry should be allowed to keep its excess profits to soften the postwar recession. Officials claim the shock will be slight

Renegotiations, a Slow Process Renegotiations of machine tool contracts has been going on for months but at this writing none of them appear to have been concluded. One of the main reasons for delay is the question whether to include in the price adjustment tools delivered to the Defense Plant Corporation, or try to segregate sales to private contractors.

Machine tool producers feel that their situation is unique, in that something like ten times normal production is being delivered, mostly to DPC plants, and the resulting supply, if turned into the market at the end of the war will kill the demand for new products for some time to come.

Claim Profits as a Bulwark Therefore, the producers believe, they should be allowed to keep current profits as reserve against a severe recession in their business. And they object to being renegotiated on the basis of their abnormal profits of 1942.

Arguments are being presented that more consideration should be given to the role the machine tool industry will be called upon to assume in any postwar program for maintaining the military strength of this country.

Producers feel too that the Services and the War Production Board are at fault for having allowed users to demand more tools than they really needed, thereby making the surplus threat to the postwar market worse then was necessary.

Plan to Lessen Stop-Work Shock Some price adjustment officials insist that the machine tool producers will get off better than they expect to. For one thing, they say the war agencies are cooperating in a plan to lighten the inevitable shock of stop orders. They recall the devastating effect of those orders at the end of the last war. They say they cannot discuss proposed termination reliefs as yet, but they are sure that converted and expanded manufacturers will not be called up and told, "It's all over between you and the government," as they were in 1918.

Another point they mention, certainly not for quotation, is that remonstrations should not be directed at administrators of the law. If you don't like your peacetime prospects, they told AMERICAN MACHINIST, tell your Congressman, and if they don't do the right thing, throw them out, and get some new ones that will.

Favor One, Face All The Price Control Boards are in a very hot spot. Suppose some certain industry sees an exceptionally difficult peacetime future and that it wants to be allowed to keep all of its profits as a sort of insurance. How can the Board or anybody else predict what the future will bring any particular industry? And, suppose a certain industry were allowed to keep huge profits on a plea of necessity. The Boards would have a score of firms at their doors the next morning with similar requests.

SOME E FLAGS WITHDRAWN

WASHINGTON — Army - Navy E flags for outstanding war production are now flying over so many plants that the services are getting worried lest they be cheapened. They are therefore keeping close track of pennant winners and are withdrawing flags from plants which fall down on the job because of strikes, absenteeism or poor production. Performance of winners comes up for review about every six months. Navy has already withdrawn more than a dozen flags; Army, which only started awarding them last July, hasn't yet pulled any back.

Tool Surplus Is Discounted Still further, renegotiators argue that a large percentage of the machine tools on hand are special designs for the production of ordnance, and that they will have to be thrown out, therefore will not contribute to the market surplus. A great many tools now in use will be worn out, they add. Also, they say, new materials and new products, especially in the automobile field, will require a large output of new kinds of tools. In their opinion, the market will not be so nearly oversupplied as many producers think it will be.

But Builders Say Otherwise But many tool builders are not convinced, and they are telling Washington that a severe slump in demand is certain, even admitting there will be deductions from the surplus. They do not believe that Congress intended to apply the price adjustment law to companies that have sacrificed their positions to the war. They feel that their peacetime expectations are the reverse of most other industries. Automobile builders and many other producers have the bright prospect of filling a deep gap in the market by the non-production period. The output of autos and many other durable goods went to zero, while machine tool production went to ten times normal.

Machine tool builders wish to have an accumulation of funds primarily as a reserve to draw upon when the anticipated long lean years hit the machine tool orders granary and secondarily for reconversion to manufacturing facilities to peacetime pursuits.

Scheduling Will Temper Changes Changes in the Controlled Materials Plan won't be as quick or drastic as was first intended when Wilson took over from Eberstadt. Handling of "B" products and the B product list are to be frozen through the third quarter. In the fourth quarter the list will be revised. Whether operation of the plan as to B products will be changed in the fourth quarter depends on success in scheduling their production. With sound scheduling, it's thought that mechanics of material allocation won't matter much, though some of the paperwork may be eliminated by a partial return to the PRP-type procedures.

Emphasize Basic Raw Materials WPB Vice Chairman Charles Wilson is putting on the heat for increased production of basic raw materials. Starting last month he has been calling to Washington representatives of the ferrous and nonferrous metal producers to work out plans for increased production. He is demanding immediate completion of metal production plants on which work has been lagging.

The steel expansion program is two to three months behind schedule, and several nonferrous plants have been just short of completion for some time. Wilson also wants operation of existing plants at higher rates: steel production directives are now based entirely on company figures as to capacity.

Greater use of the high-grade ores, ordinarily reserved for working when prices are low, is also an item on the agenda.

Cleveland Automatic Machine Company President A. L. Patrick conducts a pre-award plant tour

Goddard and Goddard Company received the burgee at a quiet ceremony. Pres. A. N. Goddard is shown holding it

Lindberg Engineering Co. President L. A. Lindberg, (l.), received the award before Chicago's Mayor E. J. Kelly and an audience of 1,500

Efficiencies Bring Award of E Burgees to Producers

WASHINGTON — Companies selected to receive the Army-Navy Production Award recently, in recognition of outstanding performance on war work, include:

Aircraft Accessories Corp., Airesearch Mfg. Co., Baker Bros., Inc., Beaumont Iron Wks., Brecon Loading Co. (Coosa River Ordnance plant), Caterpillar Tractor Co. (E. Peoria plant), Columbia Steel & Shafting Co., Columbus Bolt Wks. Co., Continental Motors Corp., Crucible Steel Co. of America (Park Wks.), Desmond-Stephan Mfg. Co., Dictaphone Corp., Douglas Aircraft Co. (El Segundo plant), Eagle Tool and Machine Co., Electric Vacuum Cleaner Co., Engineering and Research Corp., Fairfield Mfg. Co., Foote Brothers Gear & Machine Corp.

General Machinery Corp., General Motors Corp. (Fisher Body Div.), Gilbert & Barker Mfg. Co., B. F. Goodrich Co., Greenfield Tap & Die Corp., Handy & Harman (Bridgeport plant), Hendrick Mfg. Co., Holley Carburetor Co., Houdaille-Hershey Corp. (Oakes Products Div.), Hunkin-Conkey Construction Co. (Cleveland aircraft assembly plant), Ilg Electric Ventilating Co., Jenkins Bros., Kensington Steel Co., Kilby Steel Co., La-Del Conveyor & Mfg. Co., Leeds & Northrup Co., Lucas Machine Tool Co., Masonite Corp., Metlab Co., Mosler Safe Co., Mueller Brass Co., Mullins Mfg. Co. (Warren and Salem plants), Murray Ohio Mfg. Co., National Tool Co.

More Recipients

Oil Well Supply Co., Oldbury Electro-Chemical Co., Otis Elevator Co. Buffalo Wks., Perfection Steel Body Co., Pipe Machinery Co., Pitney-Bowes Postage Meter Co., Portland Forge & Foundry Co., Pratt & Letchworth Co., Ranco, Inc., Republic Steel Corp. (Birmingham, Gadsden, Central Alloy Dist., Massillon plants), Reynolds Spring Co. (Plant 1), Russell Mfg. Co., Sacramento Engineering & Machine Wks., Schwitzer-Cummins Co. (Plant 1), Servel, Inc., Simmonds Saw & Steel Co. (Intervale, North St. plants), Specialty Mfg. Co. Stanley Wks., Star Iron and Steel Co., Stoner Mfg. Corp., Stromberg-Carlson Telephone & Mfg. Co., Sylvania Industrial Corp.

Tennessee Coal, Iron and Railroad Co. (Ensley Wks., Fairfield Steel Wks.), Thermador Electrical Mfg. Co., Henry G. Thompson Co., Tokheim Oil Tank and Pump Co., Tools & Gages, Inc., Triangle Package Machinery Co., Tyson Roller Bearing Corp., United States Machine Corp. (Plant 2), United States Rubber Co. (Mishawaka), Bard, Inc., Vermont Tap & Die Corp., Vinco Corp., Weatherhead Co., Weaver Mfg. Co., Webber Gage Co., Whitman and Barnes Div. United Drill & Tool Corp., Willys-Overland Motors, Inc., Wittek Mfg. Co.

Clark Tructractor Division V. Pres. and Gen. Mgr. Ezra W. Clark accepted the burgee for that firm

D. O. James Mfg. Co. employees John Buttman and Jule Wagner (l. to r.) and Miss E. V. James, president, received pins and flag

Whitman & Barnes Pres. M. J. Kearins received the award as Detroit's Mayor Edward J. Jefferies looked on

THE AIRCRAFT HORIZON

Shipbuilder Kaiser heads company with record of lowest plane output. Aircraft councils organize central office. Plane workers await outcome of coal miners' negotiations

Enter: Mr. Kaiser. The definite arrival of the shipbuilding wizard in the aircraft industry may or may not turn out to be important, but he is bound to attract a lot of attention. Within the last two or three weeks he has acquired all of the stock of Fleetwings, Bristol, Pa., which is building a stainless steel basic trainer plane for the Army, and he has had himself appointed chairman of the board of Brewster Aeronautical Corp., Long Island, which is building SB2A dive bombers for the Navy, and trying to get tooled up to build the new 2,000 horsepower Vought shipboard fighter, F4U. Kaiser already has a contract with the Army for three super-heavy experimental cargo planes which are building on the West Coast. But the old families of the aviation industry looked upon this project with doubt and scorn, so he did not feel that he was in the business until he got hold of a real airplane company.

People may talk all they want to about Kaiser's chances of performing miracles on the airplane production line, but none can say he is not game. The Brewster plants, three of them in the vicinity of New York, have established what appears to be an All-American low in rate of production. Last year the Navy took over this firm, because of alleged inefficiency, and established a new management under C. A. Van Dusen, who had been vice president of Consolidated. But again Brewster failed to achieve an acceptable rate of output. Official figures, obtained by AMERICAN MACHINIST, show the efforts of this concern to be amazing ineffectual. One other company, also building light airplanes, with approximately the same manpower, has produced six times the poundage of aircraft in the same period. Whether Kaiser or the Navy initiated the step no official will say.

It would not be fair, except on the basis of a full report, to place blame upon any one for the Brewster situation. Mr. Van Dusen said he hoped Kaiser would get sufficient cooperation from the Government, indicating that he had not been properly supported by Washington. It is said that certain irremediable features of the plants hold back production. There is significance in the fact that Curtiss-Wright, building the same dive bomber, has been stepped on by Congress for being too slow; but Curtiss did not blame the design of the airplane.

It will be tough for Kaiser to surpass or even to equal the highly-developed production lines of companies like Bell and Boeing. He arrives in the industry at a time when two factors, mainly, have put a limit on speed of airplane output. One of these is the limited supply of materials and components, and the other is change orders. The change order is the thing that drives assembly experts crazy. If it were not for this continuous demand from the front to redesign, production would be limited only by material supply.

There are answers to both of these problems. We will be getting more and more aluminum as months go on, and we can increase the substitution of steel, wood and plastic. As for change orders, if and when the enemy is beaten down so that he cannot come out with new designs approaching ours in performance, we can slow down on the changes, and emphasize the numbers. Kaiser will have done well if he can bring Brewster up to normal or better, but his chances of passing a miracle would seem slight indeed.

The aircraft councils are building up, while the Aeronautical Chamber of Commerce is put in semi-hybernation for the duration. The West Coast Aircraft War Production Council, and East Coast group of like name, have agreed to organize a parent office to be called the National Aircraft War Production Council. The obvious reason for this is that neither of the two existing councils has authority to speak for the entire industry. The old Aero Chamber represented a competitive industry. The Councils represent a 100 percent cooperative industry. When the war ends, there will be a new setup, probably based on the Aero Chamber.

Wage adjustments by the War Labor Board in the Southern California airplane community and at Boeing are not regarded in the industry as permanent. If and when—the very moment—that John Lewis wins a $2 a day increase for the miners, the west coast airplane unions will start a drive to get what they first asked for. This will be important only in that they become the top whirl in the resulting general wage and price spiral. In the present calm, the Boeing union leaders have put reverse english on an old argument. They say the Boeing workers after they pay their living expenses, get far less than soldiers, and they, too would like to earn $50 a month clear.

Substitution of materials in aircraft construction is being worked out on a uniform standards basis by the Army and Navy cooperatively. This is being done under the direction of the Operating Committee on Aircraft Materials Conservation of the Aircraft Production Board. The Committee assigns trial materials to Army and Navy air fields. An Army observer is on hand when a Navy test is made, and vice versa, thus avoiding duplication of experimental effort. Joint standards have already been set up for the conservation of methyl methacrylate and of beryllium-copper alloy, for the use of emergency steels, substitution of zinc for cadmium, specifications of aluminum alloy products, alternative materials for corrosion-resisting steel cable terminals, the use of aircraft plywood and the use of zinc for dies.

Double Grief — Twin stingers in the tail discourage enemy fighter planes while the Liberator's bombardier goes to work on ground installations. This is the first Army Air Force release showing details of the double 50-calibre machine gun mount

Tool Engineers Meet, Elect Officers, Hear Papers and View Exhibits of War Production

MILWAUKEE—Tool and production engineers from all over the United States and from Canada met in Milwaukee on March 25, 26 and 27 to attend the eleventh annual meeting of the American Society of Tool Engineers and the "War Production Editions" of the Machine and Tool Progress Exhibition sponsored by that society. New and improved machines, accessories and tools designed to speed the production of armament material for our armed forces were displayed by 138 exhibitors. These ranged from new precision internal grinders, several types of precision boring machines, spot welding machines, saws, drill presses, an entirely new induction heat-treating machine, and coolant pumps, to quick-acting clamps and a number of interesting developments in cutting tools of several types. Of particular interest was a new spot welding electrode of the refrigerated types in which the replaceable tip requires only about ½ oz. of copper, as compared with 6 oz. or more of copper needed to make a spot welding electrode of conventional design for the same application.

Officers Are Elected

The Board of Directors of the American Society of Tool Engineers, who met on Thursday, elected the following officers for the coming year: President, Ray H. Morris, vice-president of Hardinge Bros., Inc.; first vice-president, Douglas D. Burnside, superintendent, Quickmeal Division, American Stove Company; second vice-president, C. M. V. Briner, assistant to president in charge of sales, The Pipe Machinery Company; secretary, Earl V. Johnson, engineer, Firth-Sterling Steel Company; treasurer, Floyd W. Eaton, assistant district representative, War Manpower Commission, Detroit. Adrian L. Potter was reelected as executive secretary of the society. Philadelphia was selected for the next annual meeting, which will be held in March, 1944.

Six important technical meetings occupied the time of the society members and guests when they were not studying the exhibits. These meetings included sessions on the machinability of metals, methods of increasing tool life, tool salvage, women in machine shops, new production techniques and tool engineering horizons. Brig. Gen. H. F. Safford, chief of production service, Office of the Chief of Ordnance, spoke on "The Application of Tool Engineering to War Production" at the annual banquet held Saturday night. He was introduced by Otto W. Winter, president and works manager, Sav-Way Industries, and retiring president of the society.

Papers of particular interest included a discussion of the latest developments in glass gages, presented by T. J. Thompson, industrial division, Corning Glass Works; an extensive discussion of the future possibilities of induction heating, by Frank W. Curtis, chief engineer, Milling Machine Division, Van Norman Machine Tool Company and a past-president of the society; a talk on plastics in aircraft tooling, by George H. Prudden, assistant works manager, Vega Aircraft Corporation; a discussion of hyper-milling and negative rake angles on sintered carbide tools, by Malcolm Judkins, chief engineer, Firthite Division, Firth-Sterling Steel Company, and a paper on tools and methods for high speed machining, presented by Arthur A. Schwartz, chief tool research engineer, Bell Aircraft Corporation. R. J. Goldie, vice-president, Timken-Detroit Axle Company, described an important development in gear manufacture.

Will Explain Application of Electronics to Tools

EAST PITTSBURGH—The application of electronics to metal working tools will be explained by electronics engineers as one of the features of the 1943 Westinghouse Machine Tool Forum, to be held at the Company's works, here, April 6 and 7. Many of the problems facing machine tool manufacturers and users, today and in the future, will be discussed.

In addition to the forum on electronics application, there will be at least six other major papers on current problems presented before the Forum. Also scheduled for appearance are government representatives, leaders in the machine tool industry and Mr. Tell Berna, general manager of the National Machine Tool Builders Association.

Award Trophies to Defiance and Sheffield Companies

CLEVELAND—The Sheffield Corporation of Dayton, Ohio, and the Defiance Machine Works of Defiance, Ohio, have been awarded the National Machine Tool Builders' Association President's Trophies offered at the Association's Annual Meeting held last October, for the greatest fourth-quarter increase in number of machine tools shipped, and in dollar value of shipments, it was announced by Tell Berna, general manager of the Association.

The Sheffield Corporation showed in the fourth quarter of 1942 a 224 percent increase in dollar value of shipments over the corresponding figure for the third quarter. The Defiance Machine Works showed a fourth-quarter increase in number of machine tools shipped of 100 percent over its third-quarter record.

The trophies were offered by John S. Chaffee, who, at the time of the Association's Annual Meeting last fall, was vice president of Brown & Sharpe Manufacturing Company and president of the Association. He has since become deputy director of the Tools Division, War Production Board.

Plan Wartime V-Belt Drives To Salvage Crude Rubber

MILWAUKEE—A new plan to save 250,000 pounds of crude rubber this year, announced by Walter Geist, president of Allis-Chalmers and inventor of the multiple V-belt drive, calls for "wartime drives" using shorter center distances and larger sheaves on all new applications made in 1943.

Although engineering of individual V-belt drives has been governed in the past largely by such considerations as convenience, habit and machine design, today the most important consideration is the saving of rubber for our dwindling stock pile, Mr. Geist pointed out. However, he added, the plan should not be regarded as a temporary, wartime expedient, for the increases are sound and practical—in line with a long-range trend to larger diameters.

By following the program, every buyer of new V-belt drives would not only aid the war effort, but could individually save, on the average, $15 out of every $100 they spend on new drives and $35 of every $100 ordinarily spent on replacement, according to the plan.

Lassies Don the Kilts as the Clansmen March Away

GLASGOW, SCOTLAND—The great part which women employees in the war industries are playing to increase production and to fill the gaps left by depleted skilled manpower, has been shown in several Scottish plants where women are doing work formerly thought outside their scope.

In one big Scottish engineering works producing war goods, four women became proficient as center lathe operators after four weeks of machine training, following nine months of initial training. They can now be left on their own and trusted to produce competent work.

Many of the workers in another Glasglow plant are elderly women and after a year of training, can operate capstan lathes, milling, slotting and shaping machines, turning lathes and grinders, with considerable success.

Women workers have shown a great success on repetitive work of the most monotonous types, and reports show that record outputs are being made which are commendable examples of the ability of women workers. In one case a woman operator was given a thousand parts to make in 20 hours, but finished the job in 8½ hours and

was asking for more. Production in the plant doubled in recent months.

The managers of the various plants are quite satisfied with the work of the women and praise the arrangements made for training and introducing them into the industry. Most of the arrangements for the internal operation of the works, insofar as they concern the women workers, are made and advanced by the Production Committees which are also taking a most active part in avoiding absenteeism and making suggestions to aid production.

NAMES in the NEWS

A. W. F. Green

Arthur W. F. Green has been appointed materials engineer administrator of the heat-treating and plating divisions of N. A. Woodworth Co., Ferndale, Mich. He was formerly materials engineer for Pratt & Whitney Aircraft Div. of United Aircraft Corp. in East Hartford, Conn., where he was employed since 1937. Previous connections include John Illingworth Steel Co., Poldi Steel Corp., Edgecomb Steel Co., American Chain & Cable Co., and director of the physical laboratories of Ludlum Steel Co. in Watervliet, N. Y., in 1934. Mr. Green is a member of the Technical Advisory Committee of WPB on aeronautical materials as well as a member of a newly formed committee of the American Iron and Steel Institute on additions of various deoxidizing agents to steel.

Robert G. Patterson, who has been connected with Lamson & Sessions Co., Cleveland, since 1935, has been advanced to general sales manager. During the past three years Mr. Patterson has been in charge of wholesale and industrial sales through the company's branch offices in several of the large cities throughout the country.

John L. Brown, Jr. has been made factory manager of the Sikorsky Aircraft Div. of United Aircraft Corp., Stratford, Conn. Mr. Brown has been connected with the company since 1928, having started in the Pratt & Whitney Div. at East Hartford, and in 1935 he was transferred to the Hamilton Standard Propellers Div., becoming assistant factory manager of that division in 1939.

Norman C. Einwechter, special representative for Carpenter Steel Co., Reading, Pa., has been named assistant to the vice president, and will be located in New York and Philadelphia.

Thomas C. Finnell has been named manager of the industrial department in the eastern district of Westinghouse Electric & Manufacturing Co., which involves supervision of supplying electrical equipment to war industries throughout New York state and northern New Jersey. Mr. Finnell joined Westinghouse in 1929 when he entered the graduate student course. In 1931 he was appointed an application engineer and served in that capacity until his present promotion.

George R. Atkins has been appointed manager of the branch sales office and factory of the Bristol Co. in Akron, Ohio. Mr. Atkins joined the Pittsburgh district sales engineering staff in 1935, and a year later became resident sales engineer in Greenville, S. C., returning to Pittsburgh a short time before his new assignment.

Thomas T. Bakke, formerly with Westinghouse Electric & Mfg. Co. engineering and service department in Milwaukee, has become manager of the company's manufacturing and repair division at the Milwaukee branch.

Dave L. Riley, for the past seven years associated with Greenlee Bros. & Co., Rockford, Ill., has joined the Hughes Tool Co. in Houston, Texas, as technical adviser. During the past two years Mr. Riley was loaned to the Studebaker Corp. as assistant to the vice president in charge of manufacturing, and in turn was loaned to the Tools Branch of WPB as a technical adviser and to the Army Air Forces and Wright Aeronautical Corp. on special assignments.

W. J. McIlvane, formerly general manager of sales, has been appointed vice president in charge of sales and assistant to the president of Copperweld Steel Co., Glassport, Pa.

J. Russell Duncan, secretary of Peerless Machine Co., Racine, Wis., has been named general manager of the company. He came into the Milwaukee-Chicago area four years ago after attending the University of Arizona.

Receive Promotions

Vice President *General Manager*

W. J. McIlvane

J. R. Duncan

Walter W. Brown

Walter W. Brown, engineer of the transportation department of General Electric Co., received a citation of Individual Production Merit from the War Protion Board for his accomplishment in redesigning Army searchlight cable couplers. This is the highest honor that the nation bestows on civilian war workers, and is the seventh to be awarded since the WPB war production drive started. Mr. Brown's redesign of the couplers simplifies their design and saves materials.

W. A. Steele, formerly with Crucible Steel Co., has been appointed general superintendent of the Buffalo works of Wickwire Spencer Steel Co. to succeed Fred Johnson who is retiring.

Francis J. Linsenmeyer has resigned as director of mechanical engineering at the University of Detroit and has become factory manager and chief engineer of the National Stamping Co.

W. R. Hamilton has been appointed plant manager of Northern Aircraft Products, Aviation Corp., Toledo. Mr. Hamilton was plant manager of Republic Aircraft Products at Detroit, and A. C. Moore, who replaces him, was production manager at American Propeller Corp., a subsidiary of Aviation Corp.

Herbert W McKeague has been advanced to purchasing agent in the transformer division of Westinghouse Electric & Mfg. Co. at the Sharon Works. Formerly Mr. McKeague was assistant purchasing agent in the radio division at Baltimore.

B. R. Sherrell, previously production manager of the national division of Vultee Aircraft Corp. and works manager of the Nashville plant, has been named general manager of Willys-Overland Motors, Inc., aircraft division.

F. J. Urquhart has become regional manager of the South Bend branch of the Studebaker Corp. His first connection with the organization was that of district sales manager in the Chicago office, and he was transferred to the home office last year.

George W. Codrington, vice president of the General Motors Corp. in charge of the Cleveland diesel engine division, has been elected president of the National Association of Engine and Boat Manufacturers.

A. N. Goddard, president and general manager of Goddard and Goddard Co., Inc., Detroit, has passed the general

management of the business over to his son, Emmons A. Goddard, who has been with the firm for the last fourteen years. The presidency of the company will still be retained by A. N. Goddard.

Wilson F. Howard has been named representative in charge of the Connecticut district for the Machinery Div. of Austin-Hastings Co., Inc., Cambridge, Mass., with offices at 1800 Park St., Hartford, Conn. Previous to his new connection Mr. Howard was shop manager of Jones & Lamson Machine Co. of Springfield, Vt.

Howard M. Givens, Jr., manager of tool steel sales for Allegheny Ludlum Steel Corp., Brackenridge, Pa., will make his headquarters at the Dunkirk, N. Y., office of the corporation. The shift is intended to centralize both the sales and manufacturing supervision of tool steels.

BUSINESS ITEMS

Meehanite Metal Corp. and Meehanite Research Institute of America, Inc., have announced removal of their headquarters from Pittsburgh to the Pershing Bldg., New Rochelle, N. Y. The new plant features an enlarged laboratory and research facilities.

Carnegie-Illinois Steel Corp. has established a low alloy-high tensile steel products division in its sales department with headquarters in the Carnegie Bldg., Pittsburgh. M. B. Sunderland has been named manager of sales in charge of the division.

Fred E. Garner Co., Chicago, has opened plant No. 2 at 1110 W. Washington St. in that city where the engineering staff will be located.

H. M. Harper Co. of Chicago has opened a factory branch at 210 W. 7th St., Los Angeles, with Clarence A. Gauger in charge. Previous to joining the company Mr. Gauger was associated for seven years with the Pacific Metals Co. in that city.

New Wrinkle, Inc., of Dayton, Ohio, has removed its research and development laboratories to new quarters adjoining the general offices of the company.

Salkover Metal Processing Co. has established a plant at 34-16 Borden Ave., Long Island City, N. Y., for commercial controlled atmosphere electric furnace brazing, bright annealing and other specialized metallurgical operations.

Manning, Maxwell & Moore, Inc., Bridgeport, Conn., has appointed Hugh A. Brightwell sales and service representative of its four Bridgeport divisions in the Tulsa, Okla., district.

Clarostat Mfg. Co., Inc., has announced the opening of a second plant in Brooklyn, N. Y., where its original plant is also located. The new plant will be devoted exclusively to assemblies.

Manning, Maxwell & Moore, Inc., has established a new plant in Tulsa, Okla., to manufacture oil relief valves, with G. P. Kirchhofer as plant manager, John Scott as superintendent and James W. Schwarberg, Jr. as purchasing agent. The district sales office in that city will continue at 317 E. 4th St. under the direction of Malcolm Black.

Washington Appointments

WPB, Miscellaneous:

A Labor Advisory Committee has been named in the Steel Div. to bring about further cooperation of labor and management in the steel industry, and to promote the maximum production of steel. The committee will work with director H. G. Batcheller and with Harold J. Ruttenberg, research director of the United Steelworkers of America.

Ten executives with wide experience in the steel tubing industry have been invited by price administrator Prentiss M. Brown to serve on a Steel Tubing Advisory Committee to counsel with OPA on pricing problems.

Walter D. Barry has been appointed chief of the newly organized Field Service Section of the Farm Machinery Equipment Div. This section is training farm machinery specialists in WPB regional and district offices throughout the country to handle farm machinery problems that arise in their regions.

Office of Price Administration:

Thomas J. Kinsella has become price executive of the Machinery Price Branch which has been reorganized into four sections—heavy machinery; parts, distribution and transportation; machine tools and electrical; research and liaison.

MEETINGS

Westinghouse Machine Tool Forum, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. April 6 and 7.

Swiss Industries Fair. Basle, Switzerland. May 1-11.

National Metal Trades Assn. Production Conference. Palmer House, Chicago, Ill. May 26-27.

American Iron and Steel Institute. Annual meeting. Waldorf-Astoria Hotel, New York, N. Y. May 27.

OBITUARIES

Homer C. Bayliss

Homer Calvin Bayliss, 58, a director of Motch & Merryweather Machinery Co., Cleveland, and co-manager of the Detroit office of the company, passed away after a brief illness. Mr. Bayliss served a machinist apprenticeship with the Colorado Iron Works for three years, starting in 1903. He then attended Marietta College and Ohio Wesleyan University. After graduation he taught machine shop practice and mechanical drawing at the Y.M.C.A. At the outbreak of World War I Mr. Bayliss joined the Ordnance Department and served until 1919.

Max W. Babb

Max W. Babb, 68, chairman of the board of Allis-Chalmers Mfg. Co., Milwaukee, died after an illness of a month. He had been president of the organization from 1932 to 1942 when he became chairman of the board. Mr. Babb was appointed attorney for the company in 1904, and during its reorganization in 1913 became vice president and general attorney. He was also a director of the Cutler-Hammer Corp.

Arthur L. Kimball, 57, research physicist and consulting engineer for General Electric Co., Schenectady, died of a heart attack at his home. He joined the staff in 1918 and specialized in vibration problems and in problems of elasticity, and later in the theory of fans and fluid flow. In 1932 he transferred to the engineering department.

Oliver C. Tew, manager of the Bolt and Nut Div. of Republic Steel Co., Unionville, Conn., until his retirement in 1940, passed away recently.

Joseph F. Cooley, 62, vice president and general manager of the Hartford Machine Screw Co., Hartford, Conn., died in that city recently.

Fred T. MacRae, Jr., 49, executive vice president of White Motor Co., Cleveland, passed away recently.

Francis X. Dalton, 56, purchasing agent for LaPointe Machine Tool Co., Hudson, Mass., passed away recently.

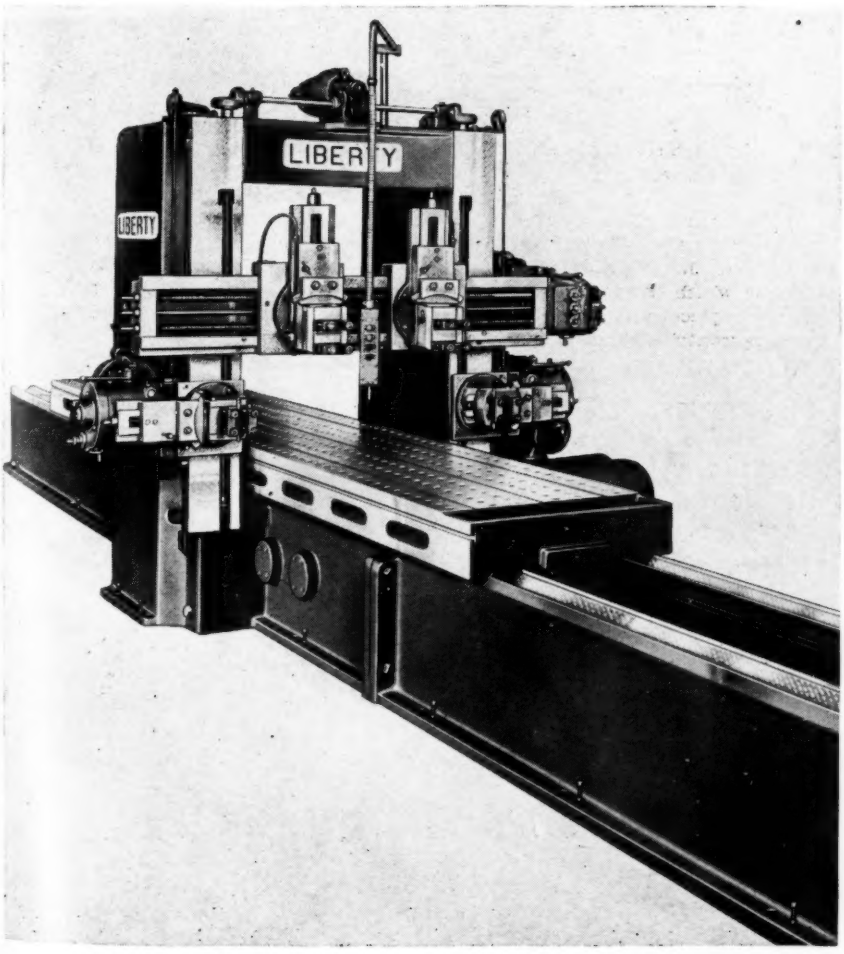
SHOP EQUIPMENT NEWS

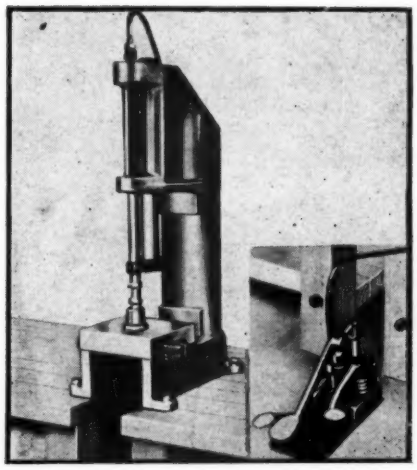
Liberty Makes a Medium-Duty, Double Housing Planer With Double-Length, Box-Type Bed Construction

A medium-duty planer has been developed by Liberty Planers, Hamilton, Ohio, to meet the needs of shops whose work cannot be handled by small standard-duty machines, and where the heavy-duty unit would not be necessary. It is of double housing style, 48×48 in., with a double length bed composed of three sections. The center section is standard length while the end sections vary in length to suit the working length of the table.

The machine is equipped with a box-type table available in lengths of 12, 16 or 20 ft. Three 15/16 in. T-slots run throughout the entire length of the table, affording ample clamping facilities for the work. Operation of the table is automatic, with electrically operated limit and slow-down switches. The crossrail has a 15½ in. face and is 12 in. deep at the center and will accommodate two heads, allowing either head full rapid traverse across the table. Elevating screws are adjustable from the top and supported on ball bearings. The rail heads have long and wide bearing surfaces on the crossrail, and are made right and left for close range. They are graduated for swiveling up to 90 deg. and have four-way power feed and power rapid traverse, with manual operation possible from either end of the rail.

Side heads of simple construction, graduated for swiveling 45 deg., can be moved below the top of the table when not in use. The feed box mechanism with its individual motor is mounted integrally with the side head. Controls for power feed or rapid traverse for up and down movement of the head are located on the feed box. These side heads can also be operated manually, including the infeed setting of the tool.





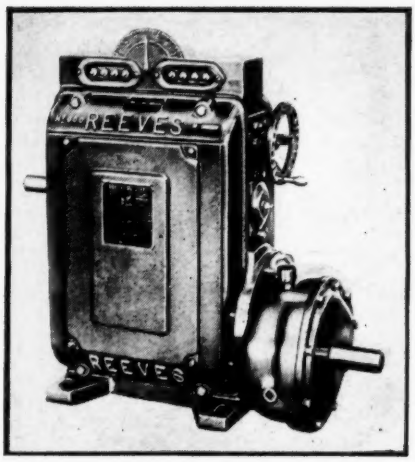
Speedpress Arbor Press Operates by Pedal Pressure

An hydraulic Speedpress (arbor press) which is entirely switch-controlled and gives pressures up to 20,000 lb., has been made available by Studebaker Machine Co., 9 South Clinton St., Chicago, Ill. No hand levers are required. By one movement of the pedal the ram moves downward to contact with the work. Any holding grip up to 20,000 lb. is provided by another foot pressure on the booster pedal. A release pedal breaks the pressure and the ram automatically returns to the top of its travel. This release is accomplished in less than a second.

The Speedpress handles such work as broaching, assembling, riveting, sizing, piercing, oil-grooving, flanging, small die tryouts, as well as forming and pressing operations. The ram pressure of ten tons provides capacity for heavier work also. This hydraulic arbor press handles work of 15¾ in. diameter, with 6 in. opening in the base for arbor work. The capacity over the table plate from the top of it to the ram in highest position is 11⅞ in. The table platen measurements are 7¼×8×1⅝ in., and ram stroke is 7 in. Weight of the complete unit is 303 lb.

Reeves Makes Transmission With Built-In Speed Reducer

A reducer type transmission which is available in two inclosed designs, horizontal and vertical, is made by Reeves Pulley Co., Columbus, Ind. This drive consists of the standard Reeves variable speed transmission with built-in speed reducer. An outstanding advantage of the drive is that considerably less mounting space is needed to obtain the lower range of speeds, where formerly



the use of auxiliary speed reducing equipment was required.

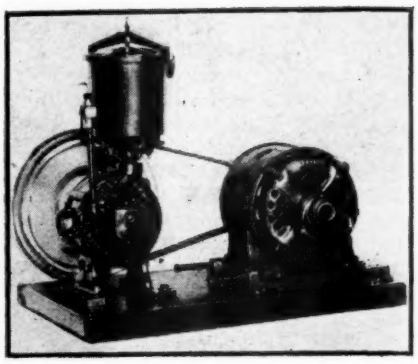
Each style is available in a wide range of speeds and in capacities from 1 to 7½ hp. inclusive. Speed changes are made by turning a handwheel, or by mechanical or hydraulic methods if completely automatic regulation is desired.

The reduction gears are mounted on the variable shaft of the transmission and this shaft serves as the input shaft for the reducer unit. The assembly of this reducer unit may be made in many different positions. The shafts of the reducer proper are mounted on heavy-duty ball radial bearings, made from high carbon steel. The helical type of gear reducer has been adopted, thus providing smoother transmission of gear load from one tooth to the next, and better load distribution, together with improving the wearing properties of the gear.

This transmission may be equipped for individual motor drive. The motor mounting is directly above the transmission, the motor base being attached to the top of the transmission frame. The connection between the motor and constant speed shaft of the drive may be either silent or roller chain and sprocket, multiple V-belts or pinion and gear.

Leiman Vacuum Testing Outfit Tests Delicate Instruments

A vacuum creating outfit for testing delicate instruments has been brought out by Leiman Bros., Inc., 136 Christie St., Newark, N. J. It is furnished with full automatic control and lubrication. The vacuum may be adjusted to any degree desired as well as the pressure. The machine is slow-running.



Standard Carbide Tool Machine Permits Dry or Wet Grinding

Standard Electrical Tool Co., 2488 River Road, Cincinnati, Ohio, has redesigned its 3 hp., 14 in. carbide tool grinder, incorporating a rigid mounting for the work table at each side. The table is graduated and permits a 5 deg. adjustment toward the wheel and 30 deg. angle away from it. The machine is operated by a 3 hp., 1,150 r.p.m. motor which is operated by a magnetic reversing starter and separate three push-button station. The spindle ends are equipped with heavy steel backing plate for mounting of the cup type grinding wheels.

Each of the wheels is protected by a guard of special construction with an adjustable splash guard.

The machine permits optional use for either dry or wet grinding, the wet grinding attachment being powered by individual motor drive and controlled by a separate toggle switch.

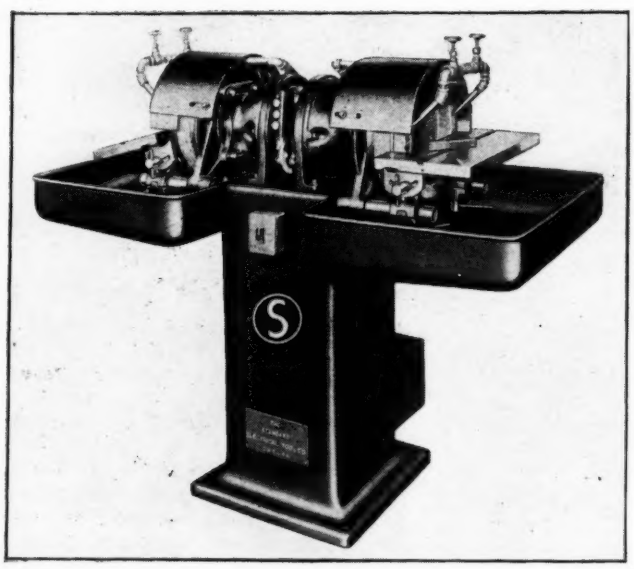
This grinder is also made in the 1 hp. 10 in., and 2 hp. 12 in. sizes.

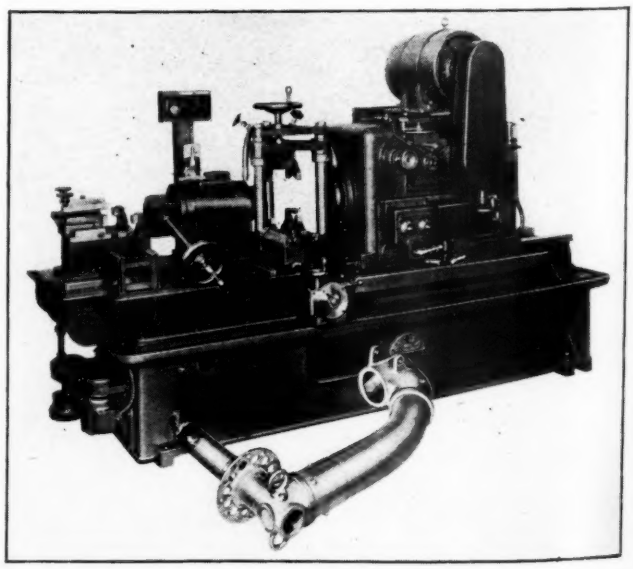
Snyder Single Spindle Machine Bores and Faces Aircraft Parts

A single-spindle hydraulic boring and facing machine for aircraft parts is offered by Snyder Tool & Engineering Co., 3400 East Lafayette St., Detroit, Mich. The machine is equipped with a unit having a heavy-duty worm wheel driven spindle, with eight speeds available.

Tooling consists of a breech lock spindle adaptor and various boring, facing and undercutting tools. The distances which the tools feed through the work piece are controlled by a revolving control dog rail, quickly set up for each individual tool. The spindle returns to position following each work cycle, and tools can be quickly exchanged. The work holding fixture is manually operated.

A part is located and clamped against two ground diameters on a shaft at right angles to the boss that is to be bored. A means has been provided on the fixture for indicating the stock variation and then compensating for it by moving the solid stops on the spindle unit. The part length indicator, located beneath the electric pushbuttons detects the amount of variation. This variation is compensated for by setting the second indicator located above the chip chute at the front of the fixture, at a reading corresponding to that of the part length indicator. Final clamping of the hub to be bored and faced is accomplished through equalizing V-jaws.





Reclaim Your High Speed Steel Cutters

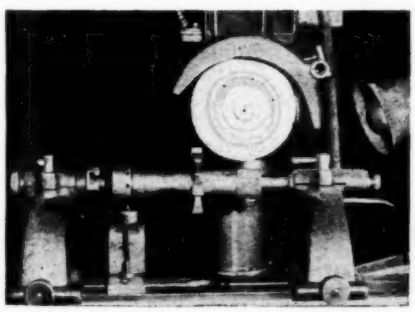
By Brazing-on STANDARD CARBIDE BLANKS

When your high speed steel cutters are "worn out", don't scrap them. They usually can be reclaimed by simply torch-brazing standard carbide tips to the cutting edges of your cutters.

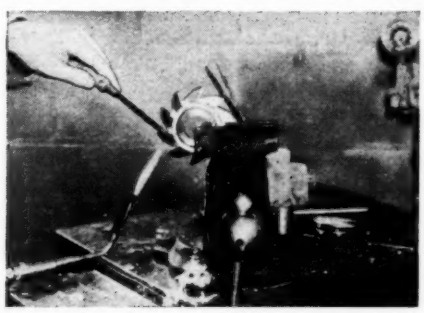
Standard styles of carbide tips are readily available to meet practically all carbide tipping requirements for all commonly used types of high speed steel cutters. With a small master stock of standard tips in your crib, you'll be prepared to reclaim and re-tool fast.

Complete instructions on request.

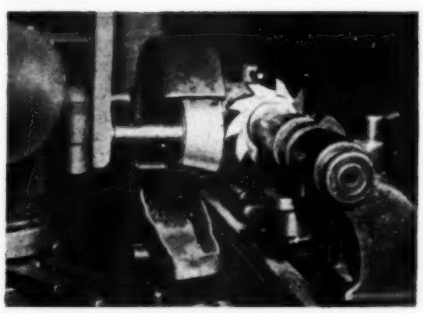
THREE EASY STEPS AND YOUR OLD CUTTERS ARE RENEWED



1 First grind a recess in the faces to which the carbide tips are to be brazed. Plan recess so that tips will project slightly over edge—for grinding back to size. Bottom of recess shou'd be ground flat surface but not necessariiy smooth.



2 Using an oxy-acetylene torch, flux, and silver solder, braze standard carbide tips in place. Process is essentially the same as regular braze for carbide tools—except braze should be completed fast to prevent oxidization and loss of chrome.



3 Grind carbide tipped "high speed steel" cutter in same way you regularly grind any carbide tipped cutter. Cutter is now ready for many times life of the original. When again worn, you can often resize using same process.

CARBOLOY COMPANY, INC.

Sole makers of the Carboloy brand of cemented carbides

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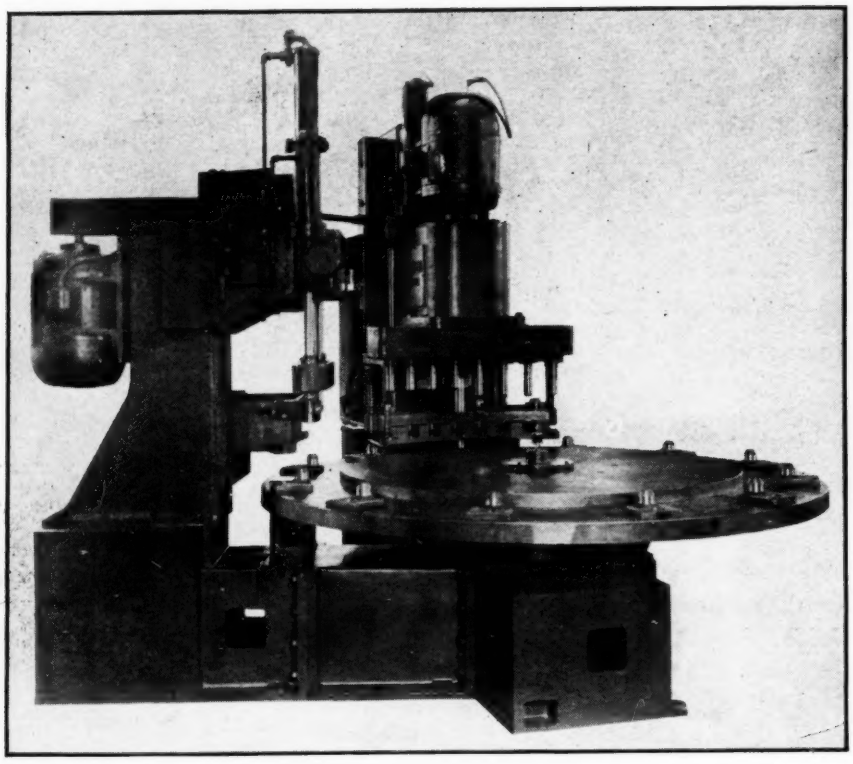
Canadian Distributor: Canadian General Electric Co., Ltd., Toronto, Canada

√ Brazing literature sent on request.

CARBOLOY TRADEMARK **CEMENTED CARBIDES**

TOOLS • DIES • DRESSERS • MASONRY DRILLS • WEAR RESISTANT PARTS

Baker Applies Special Bases and Fixtures to Hydraulic Feed Machine for Tank-Turret Index Ring Operations



Baker Brothers, Inc., Toledo, Ohio, has made use of its standard No. 26-HO hydraulic feed machine in applying it to special bases and work-holding fixtures in the development of three designs for performing various operations on tank-turret index rings.

The first of these combinations consists of two 26-HO machines, a special bed and an indexing fixture for drilling and countersinking 40 holes on a 78.75 in. bolt circle. Each machine is fitted with a two-spindle fixture so that two holes are machined complete per cycle.

The second combination comprises one 26-HO machine with an eight-spindle head and a special automatic four-spindle tapping unit for drilling, chamfering and tapping 48 holes on a 74.625 in. bolt circle, four holes per cycle. This machine is also employed for counterboring 48 holes in a mating turret ring.

The last adaptation involves one 26-HO machine fitted with a two-spindle head and combined with a special bed and 91-in. fixture plate. The automatic power indexing table moves 15 deg. per index for counter-boring two 1.250 in. holes at once.

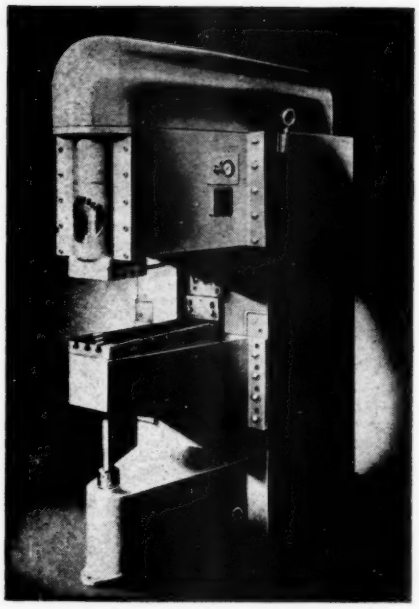
All the machines are entirely automatic in cycle, being necessary only for the operator to chuck the rings from proper rotating points and clamp. The power automatic index table is flexible so that it can be indexed for different spaced holes. The machines are built, however, with the table in a fixed position allowing for drilling only on the required bolt circles. The cutting tools are carried in the spindles of the multiple head.

Progressive Projection Welders Built in Various Throat Depths

A line of projection type resistance welders announced by Progressive Welder Co., 3001 East Outer Drive, Detroit, Mich., is available in light, medium, heavy and extra-heavy duty models. Each type is furnished in from 4 to 6 kva. capacity and a variety of throat depths.

The machines are fitted with double cooling water manifolds in the base, provided with a series of outlets to permit connection of up to six die-cooling circuits to suit requirements. The platens are also water-cooled. All models are fitted with universal T-slot platens for ready mounting of fixtures and dies. The knees of these machines are vertically adjustable to permit setting for various throat openings.

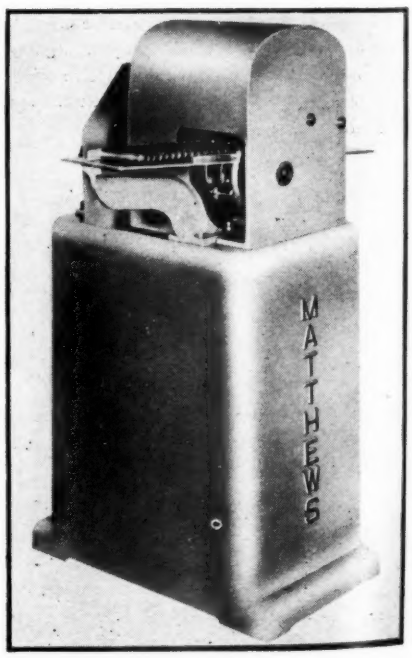
Each type of machine is available in either air operated or motor driven types. The extra heavy models are also produced with hydraulic operation. For motor operation, power is supplied by a constant speed induction motor through a combination of variable speed drive, reduction gearing and clutch. To permit mechanical timing where simple welding operations are involved, the fan type timing cams are mounted on the output shaft of the gearbox. The welders are equipped with double-acting cylinders mounted in the head for air operation. Pressure at the work may be regulated to suit the individual welding job by changing the pressure in the air cylinder to which head operation toggle links are direct-connected. Speed control valves are located on both ends of the actuating cylinder to cushion against shock and for checking the ram feed as it nears the bottom or top of its stroke.

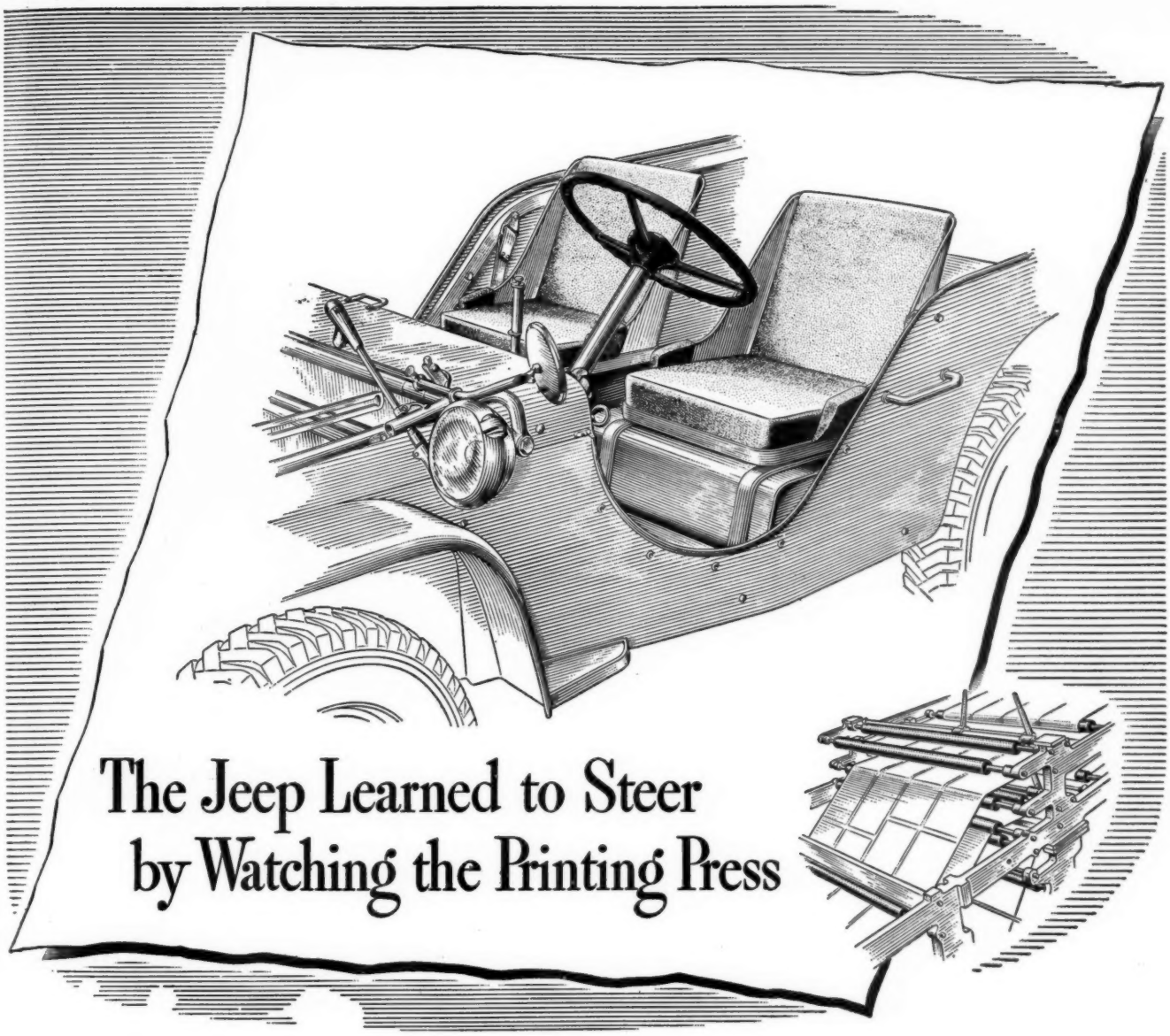


The press welders are designed for 50-60 cycle supply and 220, 440 or 550 volts.

Matthews Introduces Machine For Printing Color Bands

A No. 301 machine for printing color bands, insignia and other data on cylindrical bodies such as cartridge cases and signal flares has been developed





The Jeep Learned to Steer by Watching the Printing Press

IT'S TOP-SPEED operation hour after hour in a printing press—no leeway for breakdowns that might delay the newspaper on its way to the waiting delivery trucks. So printing press makers picked the Torrington Needle Bearing for its ability to operate successfully in high-speed service, with little need of attention.

There's no question of high speeds in the steering column of a jeep, of course ... just an occasional turn through a fraction of a revolution. But that point of long life with little attention looked just as good to the jeep builders as it did to the press manufacturers. They, too, turned to the Needle Bearing, not only for its ability to stand up in severe service, but for its low friction coefficient that gives quick response to the steering wheel, its small size that contributes to compact design, its effective system of lubrication, its ready availability for all essential applications.

THERE'S A THOUGHT HERE FOR YOU TO CONSIDER when you start the design of your post-war products. Whether your problem is one of oscillation or of high-speed rotation, the Torrington Needle Bearing will give your customers the advantages of dependable operation, efficient lubrication, low starting and running friction. And of course, *you* will benefit by the Needle Bearing's low cost and ease of installation. You can get the preliminary information you will need by writing for Catalog No. 105, which lists sizes, rates, and typical applications—and Torrington engineers will assist you in working out specific service problems.

THE TORRINGTON COMPANY
Established 1866 • Torrington, Connecticut, U. S. A.
Makers of Needle and Ball Bearings
New York Boston Philadelphia Detroit
Cleveland Seattle Chicago San Francisco
Los Angeles Toronto London, England

TORRINGTON NEEDLE BEARINGS

KEYED TO TODAY'S NEEDS

AND TOMORROW'S TRENDS

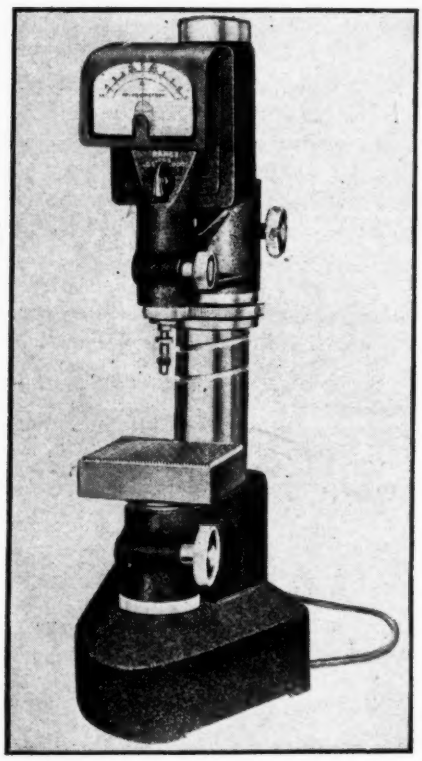
by Jas. H. Matthews & Co., 3942 Forbes St., Pittsburgh, Pa. Parts are placed in the chute by hand and rolled by gravity to the printing unit. This unit consists of a printing plate cylinder into which interchangeable synthetic rubber type is placed, an ink pan, roll and doctor which places the ink on the face of the printing plate. The cradle rolls, which are multiple stage and set into a shaft, hold the piece to be printed during the operation. The part being marked is picked up by one cradle roll and advanced to the printing stage. After the piece is printed, the cradle moves forward and automatically deposits the printed piece on the chute and is then rolled onto the receiving table or conveyor.

The drive to the printing cylinder shaft is by a ¼-hp. geared head motor with a three-speed cone pulley belt drive. This machine uses liquid ink, either dye or pigment colors.

Televiso Micrometron Gage Is Triple-Purpose Instrument

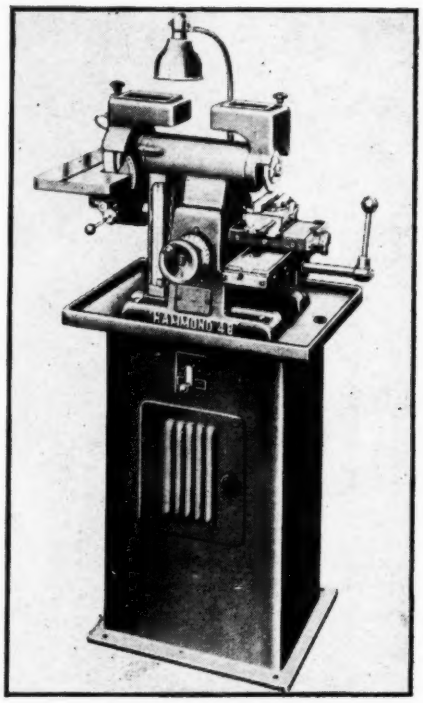
The Model 11 Micrometron gage, introduced by Televiso Products, Inc., 6533 North Olmsted Ave., Chicago, Ill., for comparison measurements is a triple-purpose instrument. By rotating of a selector knob on the face of the instrument, three ranges can be instantly selected: plus 0, minus 0.05 in.; plus 0, minus 0.005 in., or plus 0, minus 0.0005 in. This feature makes it possible to use the gage for ordinary shop work, but makes it usable in a moment for indicating differences as small as 0.00002 in.

This unit is basically an electronic type. To make a set-up, a standard work piece is inserted under the feeler point and the unit is positioned to read zero. Test pieces are then inserted in place of the standard, and the differences are indicated on the scale, which covers a range of 4 in. The unit contains an anti-parallax lens and pointer. The Micrometron is operated from 105-120 volts, 60 cycle and will check diameters as large as 8 in. The hardened steel table is 4 in. square.



Hammond Carbide Tool Grinders Have Any-Angle Attachment

Two belted type carbide tool grinders have been introduced by Hammond Machinery Builders, Inc., 1618 Douglas Ave., Kalamazoo, Mich. The 4-B model combination chip breaker and cup wheel grinder has a multi-V-belt drive. The chip breaker side, which is the right side of the machine, provides precision tool setting and accurate groove grinding with a diamond wheel. This model is equipped with ball bearing spindle and oversize bearings permanently grease sealed. A brake is provided which stops the wheels quickly when reversing on single phase current. Drip feed tanks with adjustable valves for diamond wheel grinding are integral parts of the wheelhead and accommodate either 4 or 6-in. wheels.



A double-cradle, any-angle vise is a feature of this grinder. The vise can be instantly locked into one piece at any setting with thumb levers. The vise jaws are 3 in. long, with maximum opening of 1 9/16 in.

The any-angle vise travels on a 3½ in. cross-slide and is fed by a handwheel calibrated to 0.001 in. The longitudinal slide has an 8 in. stroke and travels on dovetails with adjustable gib. The knee is raised and lowered by a handwheel calibrated to 0.0005 in.

The left side of the Model 4-B is equipped with a silicon carbide cup wheel and with an 8×14 in. tilting table, which is adjustable to any angle desired between 25 deg. below to 15 deg. above horizontal. The grinder is equipped with a ½-hp. motor, 1,750 r.p.m., 110 volt, single-phase, 60 cycle current.

Shelldraw No. 151 Compound for Steel Shell Case Drawing

Steel cartridge cases for small-arms ammunition and shell up to 2-in. Navy patterns are being drawn at the same speed as for brass, through the use of Shelldraw No. 151 drawing compound. In particular, this product of the Shell Oil Co., Inc., 50 West 50th St., New York, N. Y., has met requirements in the drawing of 30-cal. and 50-cal. steel cartridge cases. For the latter size, over 100,000 pieces have been produced in a new pilot plant and have received a Grade A rating by the Aberdeen Proving Ground.

Until the advent of Shelldraw No. 151, it is said that considerable difficulty was encountered in making the 50-cal. steel cartridge case because fabrication involves four drawing operations without the benefit of annealing the steel. The initial reduction, 61 percent, is extreme for this material. Yet, with the use of Shelldraw, satisfactory draws are being made at a speed of 88 draws per min., the same as for brass.

Shelldraw is yellow in color, has no noticeable odor, is soluble in warm water or a slightly alkaline wash. Compounded of soaps, fats, and a non-abrasive filler with an extremely small particle size—less than one micron—the compound is non-toxic and non-abrasive. Hence, tool wear is held to a minimum.

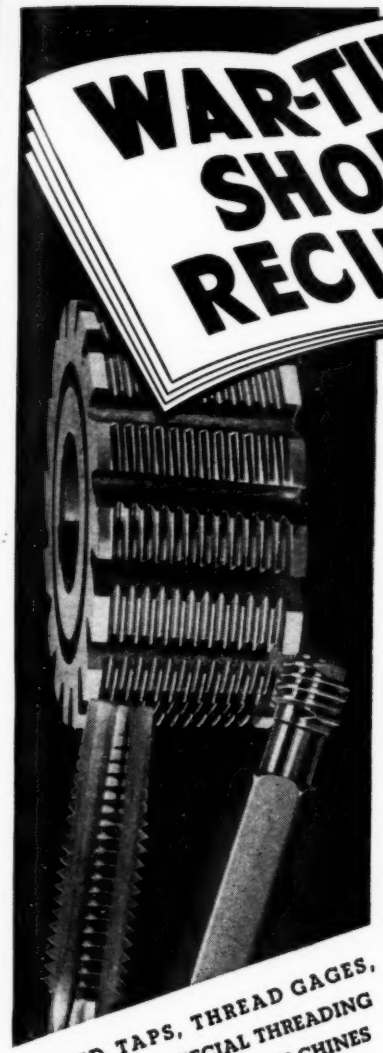
Lubrication at all stages of steel cartridge manufacture—blanking, cupping, drawing, recessing the extractor slot and machining the primer hole—is handled with the one compound. Recommended practice is to draw work having a dry coating of Shelldraw. This coating is achieved by predipping in a warm paste made by mixing one part of compound with two to four parts of water, depending upon the severity of the operation. The excess material is allowed to drain off and the parts to self-dry. This procedure insures an even dry coating of lubricant that will not wash off easily, since the soaps and fats have had an opportunity to gell in fine dispersion. A circulated coolant (Shelldraw 151 diluted 40:1) can be used in addition to the predip coating if equipment permits and the draw is severe.

Although predipping is recommended by the manufacturer, it is possible to pump Shelldraw in ordinary machine circulatory systems. A homogeneous solution is maintained in dilutions beyond the practical lubricating range. Thus for drawn work, the compound can be mixed with water in a ratio of 1:1 to 1:8, and for coolant purposes in ratios up to 1:40.

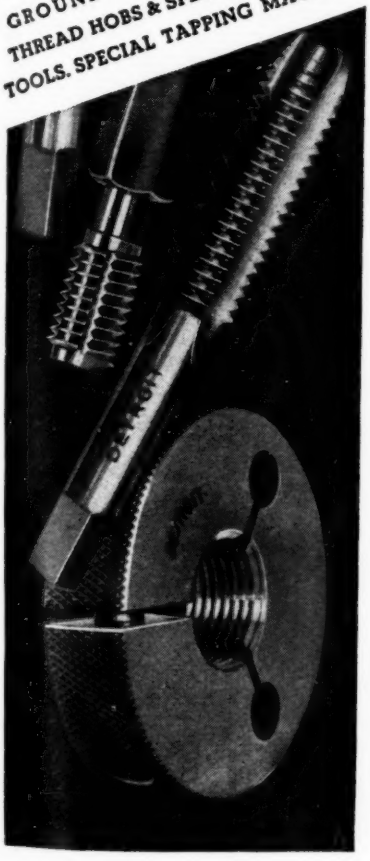
Wichita City Library

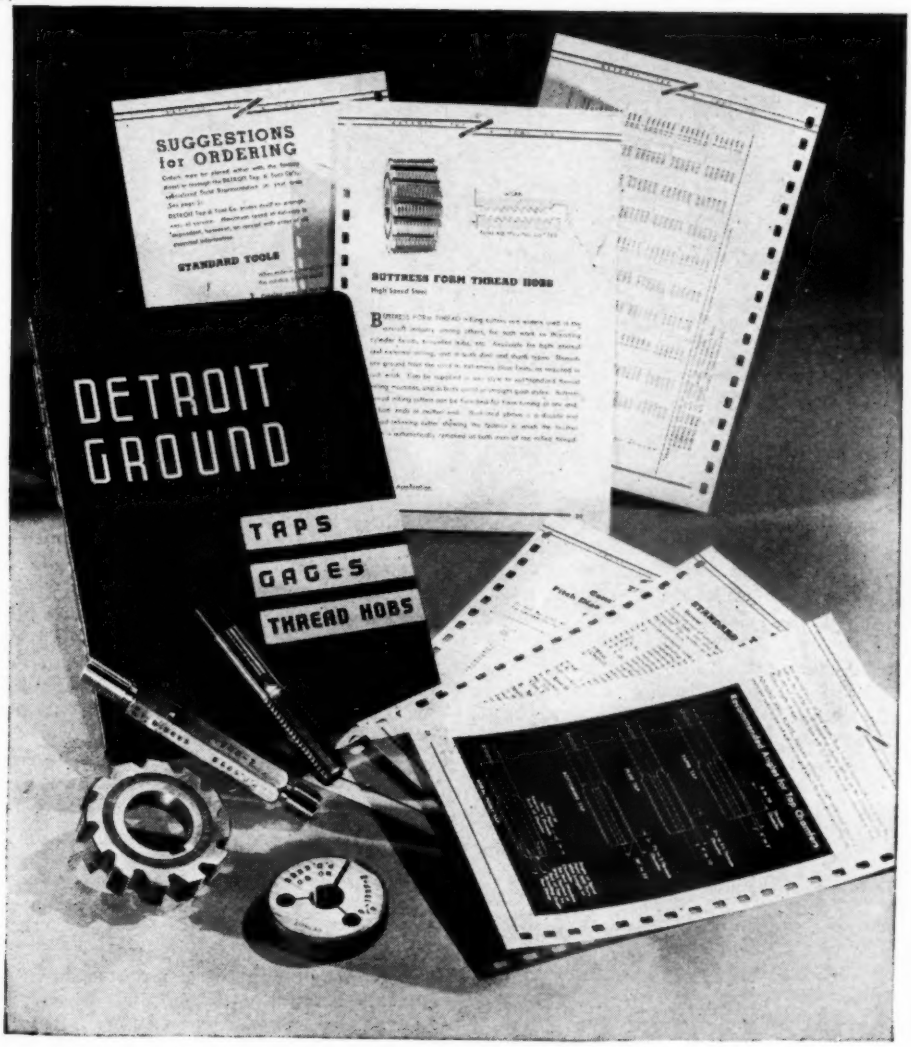
WAR-TIME SHOP RECIPES

for thread production



GROUND TAPS, THREAD GAGES, THREAD HOBS & SPECIAL THREADING TOOLS. SPECIAL TAPPING MACHINES





RECIPES — 140 pages of them — to help you get more accurate threads in production — with better taps, thread gages, thread milling cutters.

If your shop is producing threaded parts, you too should have one of these Shop Recipe books: the new "DETROIT" loose-leaf Catalog No. 22.

Write on your company letterhead.

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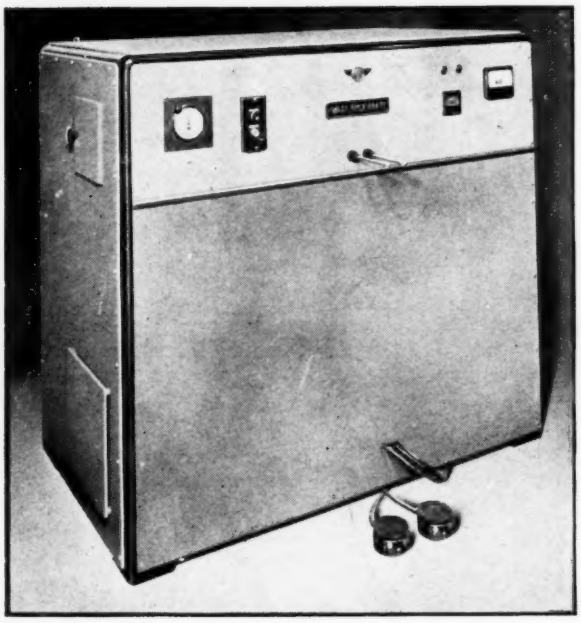
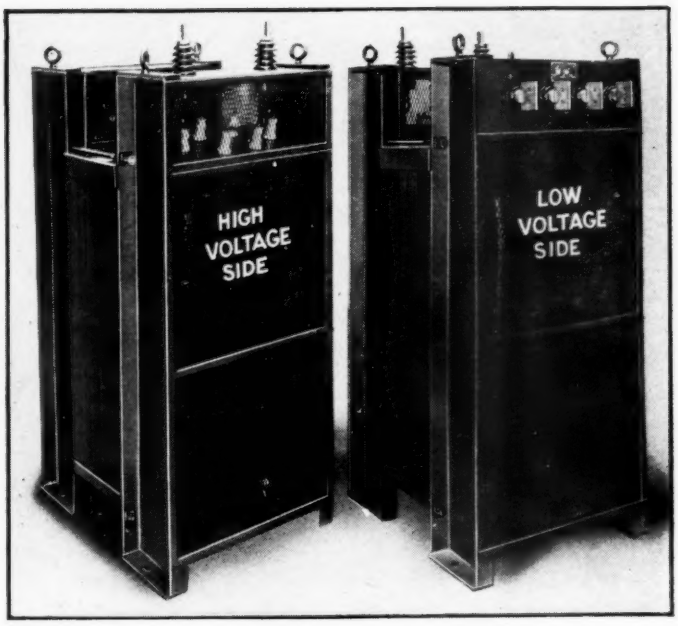




Van Norman Makes Heating Unit For Surface Hardening of Parts

For surface hardening, brazing, soldering and other heating applications requiring localized heat, Van Norman Machine Tool Co., Springfield, Mass., has announced an induction heating machine in 16 and 32 kw. sizes. To operate this unit the proper heating coil for a particular job is connected, and the heat and quench cycle required is then set for the particular job.

In operation, low voltage, taken from the input, is stepped up by a transformer to high voltage which is converted to high frequency current by means of spark gaps, condensers, induction coils and an oscillatory circuit which in turn is fed to the heating coil. The work piece is placed within the heating coil and does not become any part of the electrical circuit. This heating coil remains cool and the only heat generated is in the work piece. To change from one job to another, the operator simply changes the work-holding fixture and heating coil and resets the heating cycle. A wide variety of coils can be designed to meet practically all hardening applications.

Eisler Air-Cooled Transformer Eliminates Explosion Danger

An air cooled transformer is being offered by Eisler Engineering Co., 740-770 South 13 St., Newark, N. J., recommended for indoor installations in such plants as aircraft, ordnance, shipbuilding, and any hazardous location. Since no liquids are used, the fire and explosion dangers have been removed. The transformer may be located anywhere without the necessity of building a protective vault. No headroom is required, and therefore installation can be made where the ceiling is low or on a platform above the working area. Heat proof insulation is provided throughout its construction.

This transformer can be furnished up to 500 kva. in voltages to 4,800 volts, single phase, three phase and Scott connected three to two or two to three phase in one unit.

Acro Introduces Illuminators, Magnifying, Inspection Units

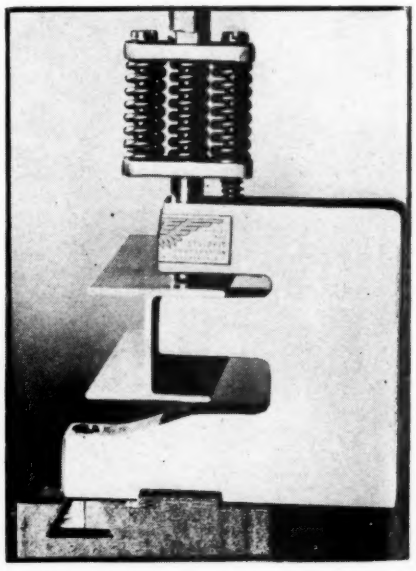
To provide specialized illumination for difficult operations on small parts and in inaccessible locations, Acro Tool & Die Works, 5324 N. Kedzie St., Chicago, Ill., has brought out a line of illuminators, magnifying and inspection units. The illuminators are offered in different models for either portable or permanent applications, and for placing the correct amount and quality of concentrated light at the point of operation. The unit is designed for illuminating the parts of a machine from any desired angle. These illuminators are equipped with soft, glareless Verd-A-Ray lamps.

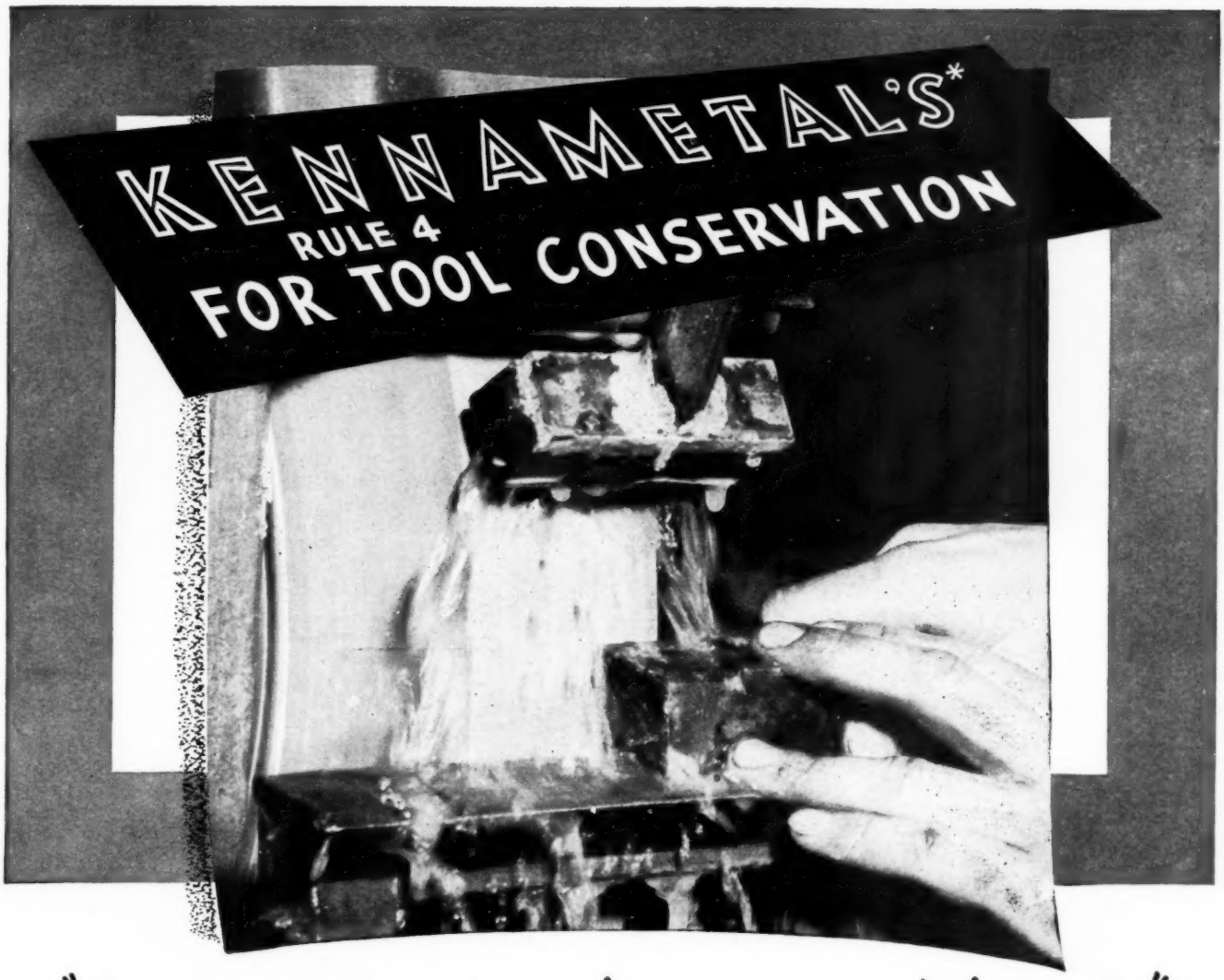
The inspection unit includes Acrolite illuminating magnifiers that provide light and magnification in the correct combination for easier assembly and inspection of small parts.

A more specialized group of instruments is embodied in the Acrolite internal illuminators, which are said to fulfill a similar function applied to the inside surfaces of deep cavities.

Strippit Hole Punching Unit Handles Extruded Shapes

For punching a series of holes simultaneously in shapes on press brakes, the Strippit Corp., North Tonawanda, N. Y., has developed the Wales Type E hole punching unit. The center projection which carries the die members extends into all shapes of extruded work and provides clearance for the legs in the lower gap. The work slides into level position on top of the die where it is pierced by the punch. Each unit is made up of punch, die, holder, stripping spring and guide. These independent self-contained units provide unlimited scattered and straight line patterns by making it possible quickly to reset or remove from the press brake rail. A





"Wet grind your steel-cutting carbide tools"

PROTECT your tools from breakdown on the job by wet grinding them when resharpening becomes necessary . . . avoid dry grinding methods whenever possible.

Dry grinding a tool frequently produces minute cracks or checks in the carbide tip. This is the result of localized heat rapidly generated in the area of contact between the tool and grinding wheel. These cracks are often not visible except after etching or sand blasting.

In addition to eliminating tool damage from checking, wet grinding is faster than dry, permits the use of more durable wheels, and washes away abrasive dusts. Frequently wet grinding will eliminate a finish grind on large roughing tools since 60 or 80 grit wheels running under coolant produce a fine enough cutting edge for most jobs.

When machine grinding KENNAMETAL steel-cutting carbide tools use only resinoid bonded diamond impregnated wheels with coolant, kerosene or light oil to keep the wheel clean.

Write for Catalog 43-B, the latest KENNAMETAL catalog which gives complete information about grinding methods and allied subjects on the handling and application of steel-cutting carbide tools.

*INVENTED AND MANUFACTURED IN U. S. A.

McKENNA METALS Co.

103 Lloyd Ave., Latrobe, Pa.

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KENNAMETAL
THE All American CARBIDE

templet can be used as a guide for quicker pattern set-ups because of the flexibility of positioning these units. The unit is locked into position on the rail by tightening a bolt, and no other adjustments are necessary.

Thor Portable Electric Drill Has Thorite Plastic Housing

Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago, Ill., has introduced the Thor ¼ in. portable electric drill, in which the grip handle, field case and gear case are made of light weight Thorite plastic. The field case slides over the frame and is held in a keyed position against the metal centerplate, and the handle is directly screwed to the frame. The gear case is held in position with a metal protection nut which is threaded to the frame and locked against the centerplate.

This drill is available in three speeds, 2,500, 3,750 and 5,000 r.p.m. Length of the unit is 8-3/16 in., and weight is 3 lb.; and drilling capacity is ¼ in.

ARMCO Aluminized Steel Is Highly Heat-Resistant

Aluminize sheet steel has been developed by American Rolling Mill Co., Middletown, Ohio, for use in products requiring exceptional resistance to heat and corrosion. It is claimed that corrosion resistance of this surface is equal to that of an aluminum sheet. The steel withstands temperatures up to 1,000 F. without discoloration. The aluminum coating will not peel or flake in moderate forming or drawing operations. Paint adheres to the surface better than on an ordinary galvanized sheet, but for most applications painting of the aluminized sheet is not required. This metal is passive in most atmospheres and resists pin-holing. When exposed to corrosive attack, an oxide film forms on the surface.

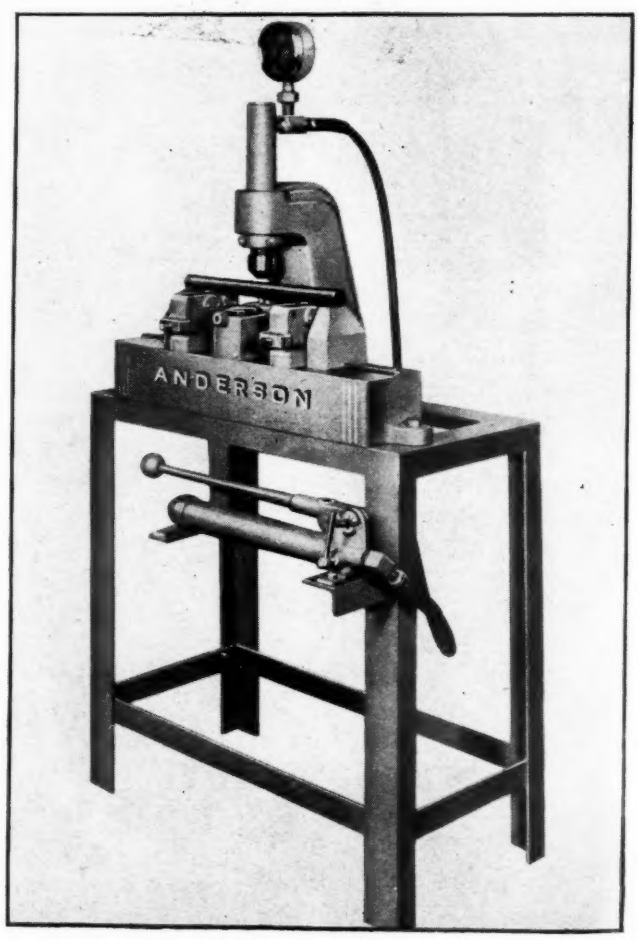
Sentry Hardening Furnace Has Asbestos Loading Shelf

Improvements have been made in the Model Y high-speed steel hardening furnace made by the Sentry Co., Foxboro, Mass. An asbestos loading shelf has been added at the front, which is of an ample width and depth to permit easy arrangement of several furnace loads. Metal guards have been added to prevent possibility of accidental contact with the live power supply. Many points throughout the furnace have been redesigned to give added strength and durability to this unit, along with the added safety factor.

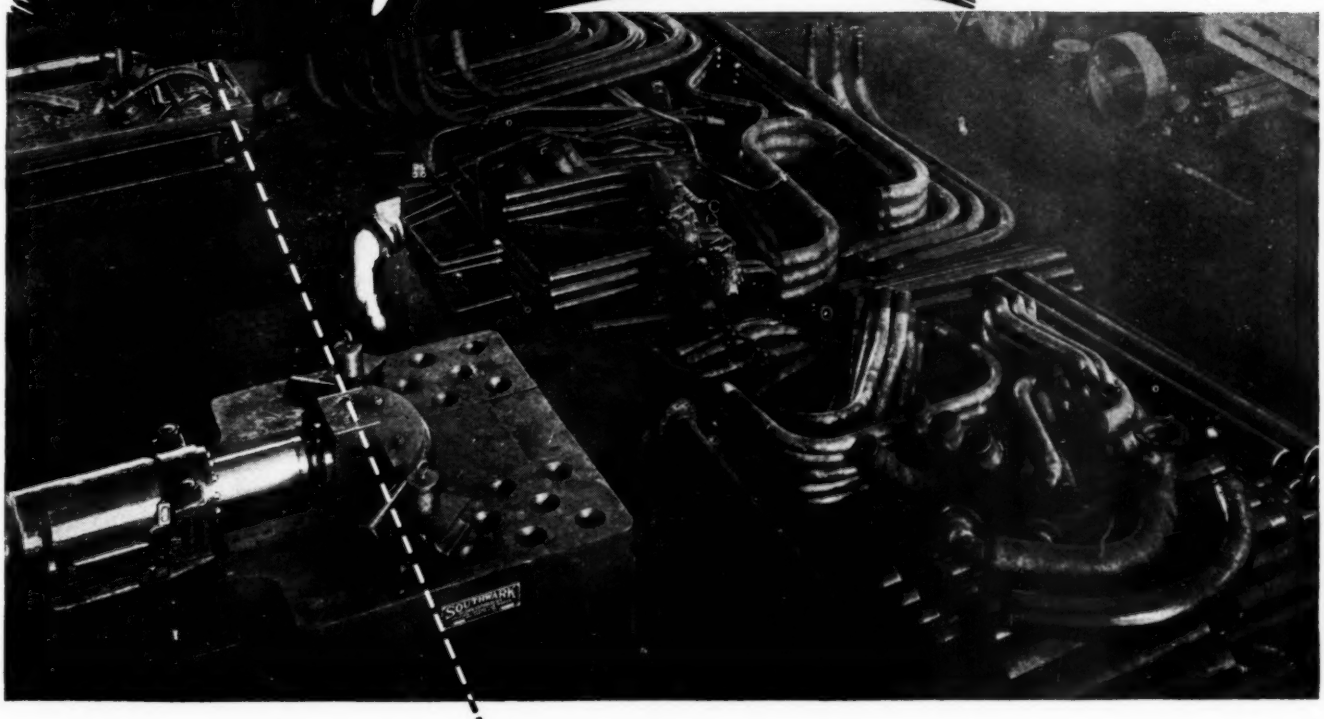
Anderson Press Checks, Bends Shafts Without Position Change

Anderson Bros. Manufacturing Co., 1907 Kishawaukee St., Rockford, Ill., has produced the Model HP-010 hydraulic hand press designed for checking and bending shafts while in the same position. When pressure is released, the spring tension on the roll brings the shaft free of the anvils to rotate for checking. The checking rolls are adjustable for different lengths of shafts, and may be removed altogether.

The press is equipped with an indicator gage calibrated in thousandths of an inch for locating high and low spots on the shaft. A pressure gage calibrated in pounds is also included on this press. This machine is built to handle work up to 1½ in. diameter, and operates by a hand hydraulic pump with a capacity up to 20,000 lb.



for Pipe Bending



Southwark Hydraulic Presses

Most bends can be made cold on this powerful 200-ton Southwark hydraulic pipe bending press. Time required for heating the pipe is saved and distortion of bend due to cooling shrinkage is eliminated.

Self-contained, this oil operated Southwark hydraulic press is under perfect control of the operator at all times—a feature particularly valuable during difficult bends. Southwark pipe bending presses are time and money savers.

Southwark builds a complete line of shipbuilding machinery including bending rolls, plate planers, keel benders, sectional flanging presses and joggling presses. New designs in these hydraulic presses and power tools are helping shipbuilders do a better job faster. Write for Bulletin K-160 which illustrates many of these products.

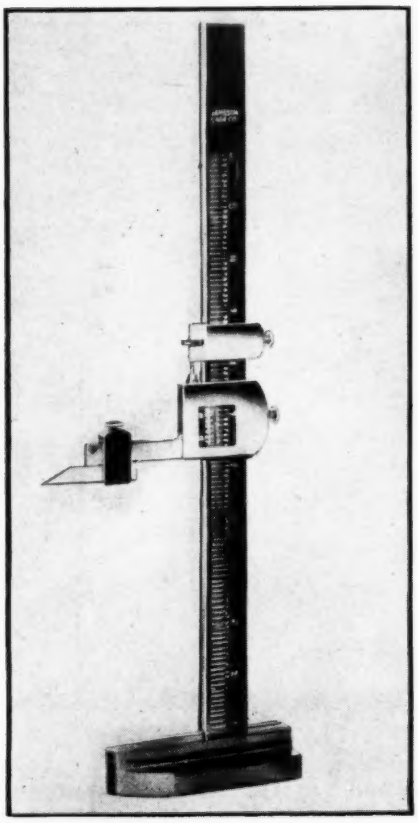
Baldwin Southwark Division, The Baldwin Locomotive Works, Philadelphia; Pacific Coast Representative, The Pelton Water Wheel Co., San Francisco, California.

BLW THE BALDWIN GROUP **BALDWIN SOUTHWARK**

Division **THE BALDWIN LOCOMOTIVE WORKS,** *Philadelphia, Pa.*

Jansson Vernier Height Gage Has English or Metric Measure

Three sizes of vernier height gage, 12, 18 and 24 in., with English or metric measure, are offered by Jansson Gage Co., 19208 Glendale Ave., Detroit, Mich. This gage is designed especially for use



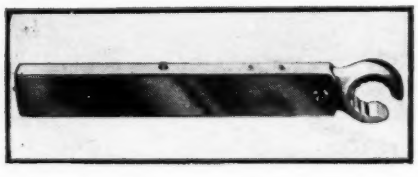
in jig and fixture making, and for general layout and inspection work, and forms an adjunct to gage blocks in angle measurement and other operations where unusual accuracy is required.

Livermont Torq-Snap Wrench Gives Audible, Physical Signal

Tubing Seal-Cap, Inc., 215 West 7 St., Los Angeles, Calif., is offering a snap-acting torque wrench which gives both an audible and physical signal when the selected predetermined torque load has been reached. It is marketed under the trade name of Livermont Torq-Snap.

No dials or indicators are involved in its design, thus requiring no visual attention to operate. When set to the desired torque load, the wrench gives a high-pitched audible click which is accompanied by a physical sensation transferred to the operator's hand as soon as the proper load is reached. It works on the principle of a spring bar deflection. The deflection in the main bar bends a secondary spring which snaps over the center when the pre-set load is reached. This causes a slight drop in the torque curve.

Although developed for use in applying required torque load to tubing "B" nuts in aircraft plumbing, the Torq-Snap will be available for such uses as engine base, cylinder head, spark plugs and connecting rod bolts. It is being made available in twelve sizes, with open or box ends, either offset or straight.



Adler Acetylene Generator Makes Use of Lump Carbide

A portable high-presure acetylene generator for welding, cutting, soldering, and brazing has been made available by Adler Manufacturing Co., 1440 North 4 St., Milwaukee, Wis. This equipment uses lump carbide instead of feeding rice carbide into the water. The Adler system immerses the carbide totally in the water, and the resultant acetylene gas pressure forces the water into the outer chamber. This stops the further development of acetylene until the developed gas has been used.

Thereupon the water again reaches the carbide and forms further gas. Automatic control eliminates hand operation of pressure and safety valve. This generator is available in carbide load capacities of 12 or 25 lb.

Benjamin Floodlight Projector Has an Adjustable Spread

To meet wartime needs for protective floodlighting and lighting of yards, and other outdoor work places, the Benjamin Electric Manufacturing Co., Des Plaines, Ill., has made available the Type RDS floodlighting projector. All

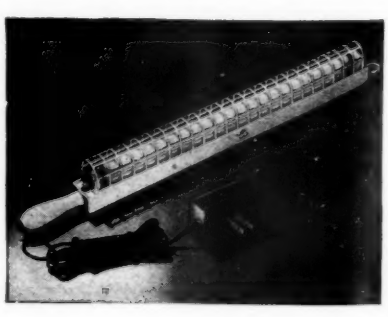
parts of the projector formerly made of aluminum, brass, or other nonferrous metal are now furnished in steel or cast iron treated by porcelain enameling and other rustproofing to make it resistant to corrosive influences.

The beam spread is adjustable over the entire range from narrow to wide, making it possible to fit the beam to the requirements of the installation. A special focusing mechanism permits placement of light exactly where needed. The projector is furnished for 300 and 500 watt general service lamps, or 500 watt floodlighting lamps; also for 750 and 1,000 watt general service lamps, or 1,000 watt floodlighting lamps. The unit has vertical and horizontal stops which automatically reposition the projector and eliminate need for resetting, after it has been tilted or turned. Each model is supplied with plain, stippled or ribbed heat-resisting glass covers.

Extensolite Fluorescent Lamp Useful in Inspection Work

Extensolite is a portable fluorescent lamp made by Edwin F. Guth Co., 2615 Washington Ave., St. Louis, Mo., which is useful in assembly and inspection of airplane engines, under instrument panels, wing interiors, inside large projectiles, and many other adaptations.

The unit is made of steel with a wooden handle, provided with a guard which hooks on at one end and is held by a knurled thumbnut at the other end. It is available in two sizes, 14½ in. long by 1¼ in. wide, or 24½ in. long



WANT TO PREVENT RUST?

Some technical information of great importance to all interested in anti-corrosion coatings

BACK IN 1932, Quaker made some "rustproofing oils and greases" as did several other concerns in the country. These products were usually mineral products of varied viscosities, some of which contained chromate. They worked pretty well, but just how well no one really knew.

Protecting Aircraft Parts a Serious Problem

Then, one of the large aircraft engine manufacturers got into serious trouble, as precision parts rusted on the production line and finished motors shipped to distant points arrived in a deplorable condition due to severe corrosion.

After a preliminary survey by a Quaker Process Engineer, our research laboratory went on the job. The first thing, obviously, was to set up a laboratory method that would accurately and effectively measure the value of a rust preventive coating. Salt sprays had been used in the past but they did not give an accurate measure of what was wanted. Even salt spray tests varied widely.

New Product Developed

So, in 1932 Quaker built one of the first, if not the first, humidity cabinets designed specifically to measure semi-permanent rust preventive coatings of an oil or grease type. For the first time one could accurately compare various "slushing mediums" and measure their value under humid conditions at varying temperatures.

Thus a revolutionary type product was developed and the problem was solved for the aircraft engine manufacturer. A line of Quaker Ferrocotes was born that has a wide acceptance among the aircraft and affiliated industries.

Accurate Measuring Technique

But probably more important, a laboratory technique was developed over the next ten years which has enabled the Quaker organization to develop better and better rust preventives. Today, rust preventives are measured in new type humidity cabinets that maintain a constant flow of moist air at a temperature of 120 deg. Fahr. throughout the cabinet. Thus, test results are reproducible time and time again and are definitely tied in with actual conditions met in the field.

However, preventing rust isn't the only thing that must be measured in a good anti-corrosion coating. Cleanability in solvent or alkali as well as the type of film left on the metal after long standing are of tremendous importance.

"Ideal" Rustproofing

Today, the best type of Quaker Ferrocote gives maximum results when applied at room temperature in a liquid form. The resultant coating is a dry, wax-like film. This does not soak into paper and containers nor run away at high temperatures. It stays where it is put, leaving a rustproofed piece that is really rustproof. It is clean to handle and can be inspected and even "miked" through the film and can be readily removed, if desired.

Quaker Process Engineers are thoroughly trained in the methods and materials necessary to give maximum rustproofing results. Their experience and Quaker Ferrocotes can be admirably applied to precision parts, shells, guns, automotive products or any other metal object.

You may profit considerably by discussing your corrosion problems. There's no obligation. Just write or wire.

QUAKER CHEMICAL PRODUCTS CORP.

CONSHOHOCKEN, PA.

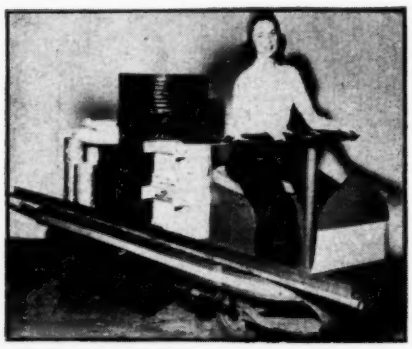
OTHER PLANTS: CHICAGO AND DETROIT—WAREHOUSE STOCKS IN PRINCIPAL INDUSTRIAL CENTERS

and 1⅝ in. wide. These lamps are wired for 110-125 volts, 60 cycle, a.c.

The channel of the Extensolite acts as a reflector directing soft, diffusing light rays to the desired area, away from the worker's eyes.

Blue Streak Platform Truck Has a Small Turning Radius

A Blue Streak model electric platform truck has been made available by Rocky Mountain Steel Products Co., 1346 Wall St., Los Angeles, Calif. This truck features an 18 sq.ft. platform of ½-ton capacity and is provided with a seat, steering wheel and a foot throttle for

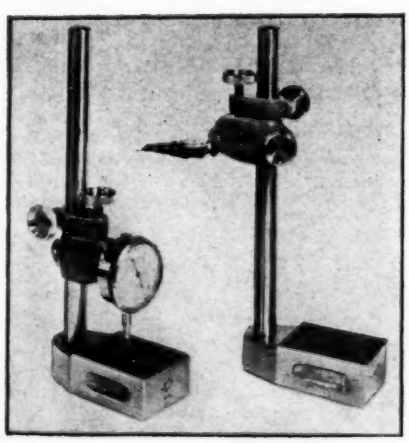


operation like an automobile. It has a small turning radius which is an advantage when being used in crowded areas.

The Blue Streak is furnished with a set of 24-volt batteries which may be recharged without being removed, while the truck is idle, through a built-in plug at the front.

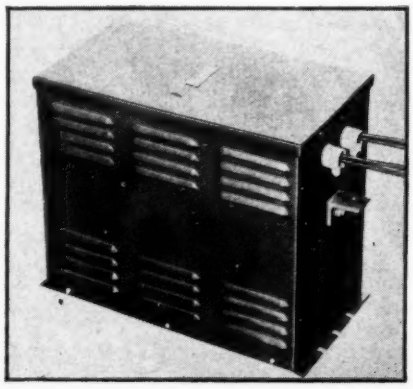
Dickerman Rigid Height Gage Made With Grooved Anvil Base

A rigid height gage and comparator, which can be set to half a tenth, has been developed by H. E. Dickerman Mfg. Co., 321 Albany St., Springfield, Mass. It has a grooved anvil base and 10 in. column. This gage serves as a companion tool for size blocks. The thumb-screw adjustment is threaded, with upper and lower members having threads of different leads. A complete turn moves the indicator 0.006 in.



G. E. Voltage Stabilizer Provides Constant Output

A constant output of 115 volts from circuits varying between 95 and 130 volts is provided by the voltage stabilizer brought out by General Electric Co., Schenectady, N. Y. It is not affected



by variations in load from no load to full load, or by changes in power factor from unity to 0.8 lagging. It is designed to operate continuously throughout the range from open to short circuit without damage.

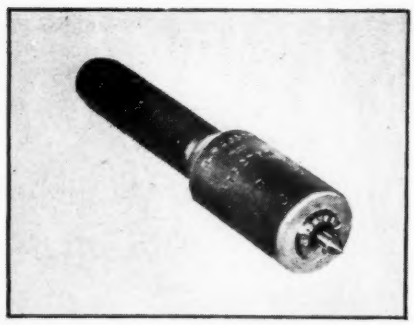
This equipment can be applied for voltage regulation of X-ray machines, and for calibration of meters, instruments and relays. Ratings from 50 to 5,000 va. are available.

Rose Heavy-Duty Swivel Caster Made With Integral King Pin

A heavy-duty all steel swivel caster has been introduced by Rose Manufacturing Co., 12400 Strathmoor, Detroit, Mich. Its construction features a drop-forged baseplate with the king pin integral. The caster swivels on ⅜ in. ball bearings that ride in removable heat-treated steel races. While Hyatt bearings are standard in the wheels, any other special bearings can be furnished.

New Methods Steel Type Holder Marks Shaft Ends with Center Hole

An improved steel type holder which may be used with individual type or with logotypes has been produced by

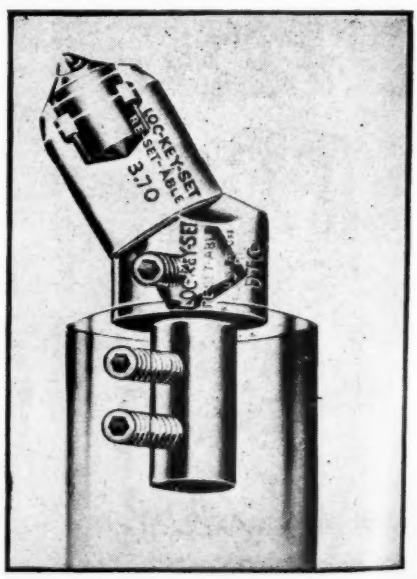


New Method Steel Stamps, Inc., 145 Jos. Campau St., Detroit, Mich., for marking the ends of shafts and other parts having a center hole. Two types of shanks can be supplied, turned, for mounting in a press; knurled, for hand use. The holder is equipped with a floating locating pin backed up by a spring to insure proper register of the markings around the center. To form the proper radii, individual steel type or logotypes are made in tapered segments. These segments are held firmly in position by setscrews and a spring sleeve. All type characters are made with the Newco bevel, which is said to reduce stamp wear and provide clear marking after continued use.

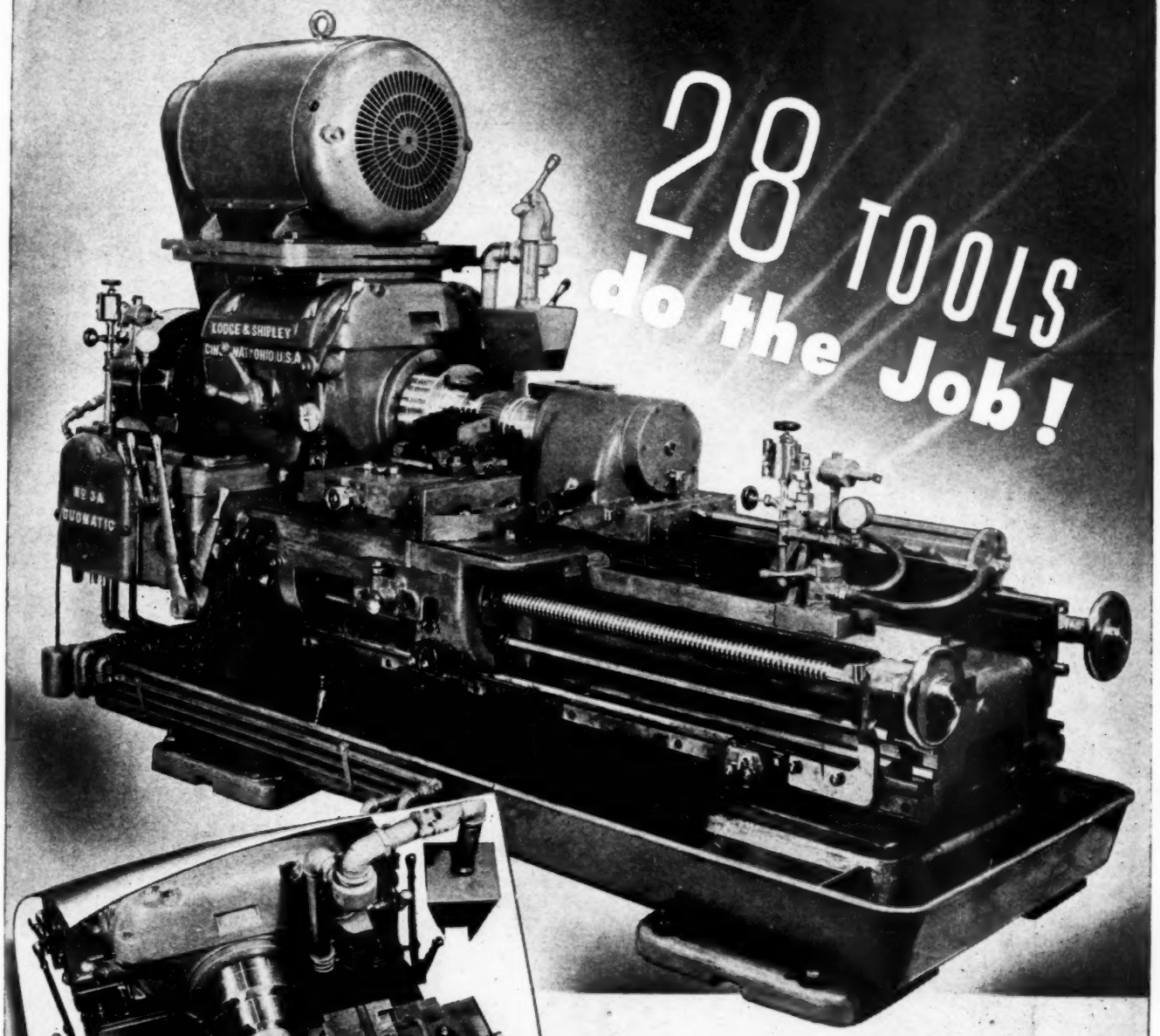
Diamond Angle-Set Holder Features a Rotating Nib

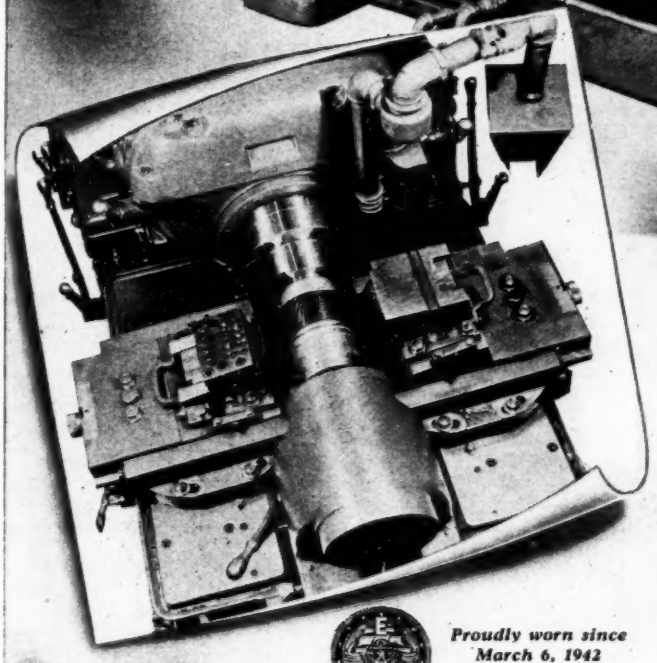
A 30 deg. side angle lock set holder has been developed by Diamond Tool Co., 938 East 41 St., Chicago, Ill., which enables bullet nose grinders, using centerless grinders with the templet attachment, to use common quality diamonds to form wheels by dressing from 1 to 6 in. radius with the device.

The mean-fixed position left or right in which the diamond nib is held prevents wear to the setting in this dressing operation, and eliminates the use of thin diamonds and weak points for dressing. A feature of this tool is that it permits rotation of the nib to present a new sharp edge of the diamond to the wheel.



28 TOOLS do the Job!





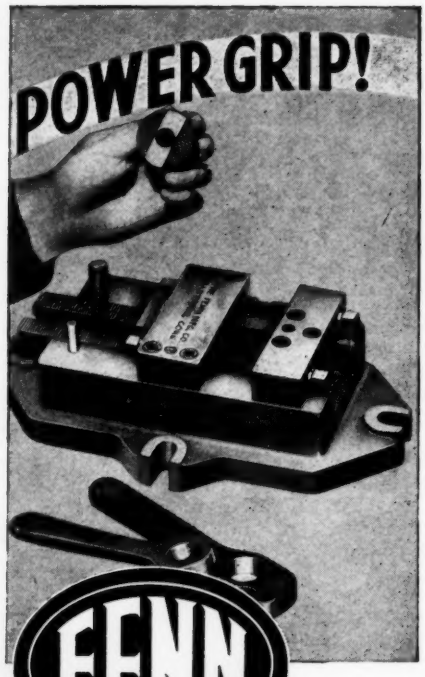
Machining tapered fins on aeroplane engine cylinder barrels with two banks of tools . . . on a No. 3A Duomatic Lathe. • • • •

Proudly worn since March 6, 1942

Write for complete illustrated Bulletin No. 601

THE LODGE & SHIPLEY MACHINE TOOL CO.
CINCINNATI, OHIO, U.S.A.

ENGINE LATHES TOOL ROOM LATHES AUTOMATIC LATHES



QUICK ACTION VISES

The Illustration Tells The Story

SERRATED surfaces both on sliding jaw and clamp bushing of the Fenn Vise give positive holding security. No possible chance of work slipping with this gripping feature. No shearing strain on clamp bolt either—only tensile strain for which it is amply heavy. Note the serrated surfaces. Note that they mesh perfectly — uniformly — yet can be instantly released for quick adjustment to other work. Note bolts for holding special jaws; quickly adapted for holding work without slipping, no matter what shape.

Used in these industries:

Airplane Engine Parts
Machine Gun Compensators
Machine Gun Parts
Automobile Parts
Refrigeration Parts
Electrical Equipment
Tool Making
Precision Instruments
Special Jobs and Accessories
And any small-parts production

Send for Bulletin No. 10

THE FENN MFG. CO.
HARTFORD, CONN.
ESTABLISHED 1900

Twitchell Greaseproof Bag Seals With Finger Pressure

For protective wrapping of metal parts the Packaging Div., E. W. Twitchell, Inc., 42 Public Ledger Bldg., Philadelphia, Pa., has introduced a bag made from a specially treated and laminated paper which is resistant to oil penetration and is moistureproof.

This bag is heavy and pliable and will readily adjust to accommodate angular shapes without tearing. It self-seals by creasing the lip of the bag with a firm finger pressure, thus requiring only one motion to close. The bags are available in any size.

Stasafe Women's Eye Shield Has Hair Protection Feature

The No. 9 Stasafe eye shield for women has been announced by Standard Safety Equipment Co., 232 W. Ontario St., Chicago, Ill. It is light weight and has a quarter-dome head shield made of fiber providing protection for the hair. The headgear can be supplied with a leather sweatband or cellulose sponge. The shield is also available without the quarter dome protection. It is designed for raising or lowering of the front to suit convenience.

American Identification Badge Is Locked With Special Tool

A reusable and tamperproof identification badge has been made available by American Emblem Co., Inc., Hyde Parke Ave., Utica, N. Y. The reusable feature eliminates the cost of providing a new one with each employee change. Colored paper inserts can be used when shifting employees to different departments. The employees' photographs and color designations are locked with a metal rivet by means of a special tool. When sealing, the closing die engraves an identifying letter of the firm name on the face of the rivet. To dismember the unit, the opening die breaks through the rivet, destroys the seal and loosens the badge parts.

Arvey Fiber Utility Can Is Made Water Resistant

A utility can made of single-ply impregnated fiber has been introduced by the Arvey Corp., 3462 N. Kimball Ave., Chicago, Ill. It has a 20-gal. capacity, is light in weight and water resistant. This can is equipped with rope handles and an overlapping cover of the same fiber material. All seams are made with heavy flat wire stitching.

Ply Garb Protective Clothing Has Flameproof Cloth Feature

Ply Garb protective clothing has been announced by the Milburn Co., 905 Henry St., Detroit, Mich. It is made of feather-weight, plastic-laminated cotton cloth and is flameproof. The sleeves have air vents to guard against excessive perspiration. The apron is available in both full-front and split-front models and is made for men and women. Adjustable shoulder straps make it possible to fit the apron to the individual.

NEW MATERIALS

Chace Manganese Alloy No. 772 Comes in Strip, Rod or Sheet

Introduction of manganese alloy No. 772, having over 70 percent of manganese content, has been made by W. M. Chace Co., 1600 Beard Ave., Detroit, Mich. Characteristics of this alloy include a high vibrating damping constant, a low thermal conductivity combined with ductility and high tensile strength, a high thermal expansion rate and electrical resistivity. The electrical resistance is 1,050 ohms per circular mil foot.

This alloy is suited for such low temperature resistor applications as auxiliary heaters for circuit breakers, rheostats and electrically heated expansion elements. It is said that No. 772 manganese alloy can be readily fabricated by the usual rolling, drawing and machining operations. It is available in the form of strips, rods and sheets.

Carpenter Free-Cut Invar 36 Has Free Machining Properties

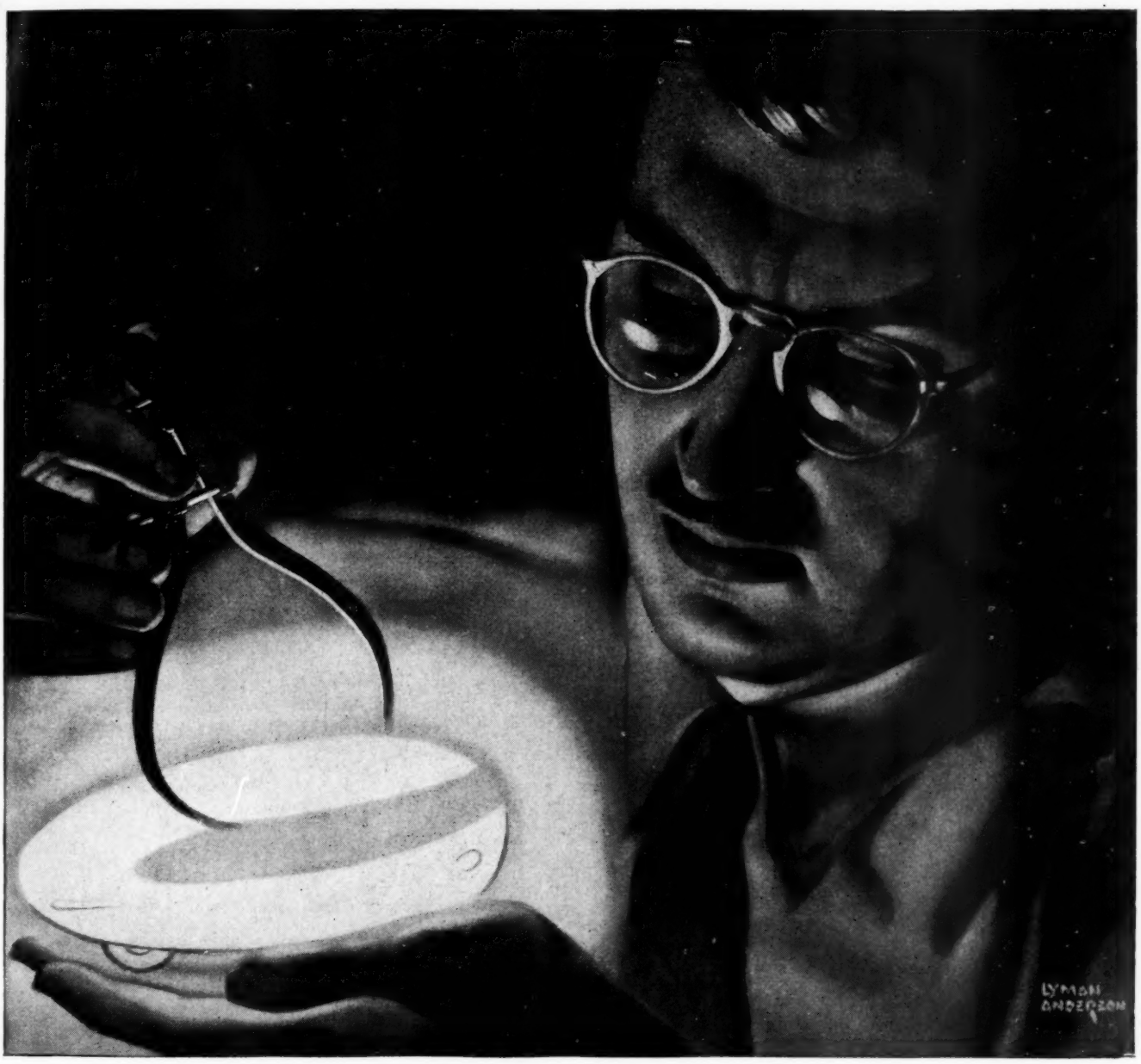
Invar has now been made available by Carpenter Steel Co., Reading, Pa., in a free-machining grade known as Carpenter Free-Cut Invar 36. The addition of selenium to the alloy gives it this property, and does not alter the low thermal expansion characteristics of the metal, but is said to have faster machining time than the regular Invar bar stock.

Keystone Small Iron Parts Produced by Powder Metallurgy

Keystone Carbon Co., 2056 State St., St. Marys, Pa., is producing small parts of iron such as cams, eccentric parts, levers, rotors, and slide blocks by powder metallurgy in which pure metal powders are molded to exact size and shapes in one operation.

American Type A Steel Wool Is Made In 4-In. Ribbon Form

American Steel Wool Manufacturing Co. Inc., 42-26 Orchard St., Long Island City, N. Y., has produced Type A steel wool which comes in ribbon form 4 in. wide, and is available on spools weighing 12½ lb. The wool has application in the aircraft industry, such as for cleaning sheets that are to be spot-welded, for polishing propellers and for all general cleaning and polishing



30,000,000 motorists will hold their breath

WE Americans might now be staring grimly at defeat if we had not thrust our industrial economy ten years forward over night. To do it we have drastically cut our own standard of living.

When it is over, when gasoline, tires, and the leisure to use them, are once again available, 30,000,000 motorists will hold their breath. Will look to Detroit for cars wrought of plastics and light alloys, cars that can whisper the miles away on a few cupfuls of fuel. For Americans picture an all-out peace when they finish a total war.

Never has an industry been able to feel surer of its market. And never have manufacturing problems appeared so complex. Innumerable materials will be available. Which should be employed for what? How can it be used to speed production, to better performance, to prolong service, to quicken sales?

For impartial answers, industry can bring questions about metals to Revere. For just as industry in the future will not be restricted to the traditional materials, neither will Revere. In addition to widening still further the uses for copper and its alloys, Revere has developed facilities for the manufacture of the light metals since the start of the war, and is pioneering in the production of wholly new alloys with important properties that can cut manufacturing costs for many industries.

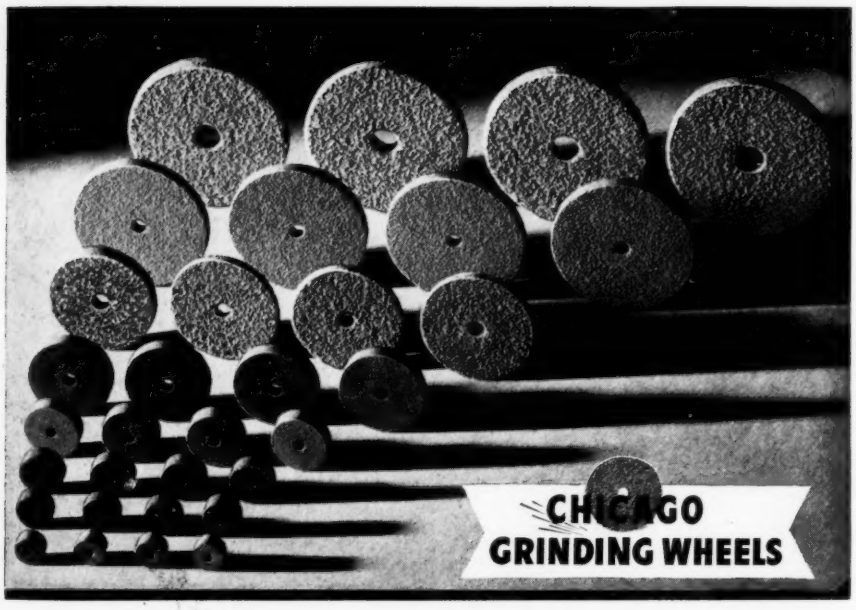
Today the copper industry is producing only for victory. Copper is not available for anything else. But post-war planners with specific problems in metals are referred directly to the Revere Executive Offices in New York.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

Executive Offices: 230 Park Ave., New York



FOR QUICK ACTION

• Our wartime strategy of making wheels only 3" in diameter and under is approved and endorsed by W P B. We make a 24-hour a day job of it. All vitally needed wheels are shipped promptly. There is no let-up. Our central location gives us a head start on deliveries.

CUSTOM BUILT WHEELS

Just the right wheels for your particular job, no matter how precise or difficult it is.

The moment we have your grinding problem, it's turned over to abrasive engineers who make up the wheels that do your job better and faster.

Years of research and *Specialized experience are behind each Chicago Grinding Wheel.

AMERICA'S HEADQUARTERS FOR
MOUNTED WHEELS
SMALL GRINDING WHEELS
Half a century of specialization has established our reputation as the Small Wheel People of the Country

You can depend on prompt deliveries. GET IN TOUCH WITH US!

TEST WHEEL

Tell us the kind of job and size wheel you need. We'll be glad to send one without charge.

CHICAGO WHEEL & MFG. CO.
1101 W. Monroe St. Chicago, Ill.
Dept. AT-4

Send Catalog. Interested in

☐ Grinding Wheels
☐ Mounted Wheels
☐ Send Test Wheel.

Size.....

NAME .....

ADDRESS .....

work. Steel wool spindles attached to a motor or drill press are used to remove burrs from non-ferrous sheets, light castings and stampings.

Aquella Waterproof Paint Comes in White Powder Form

A waterproofing mineral paint for use on concrete, cement and brick walls, called Aquella, has been brought out by Modern Waterproofing Paint Co., 1270 Sixth Ave., New York, N. Y. It is available in the form of white powder packed in bags and drums and is diluted by mixing with water. Application to the surface is made by brushing.

TRADE PUBLICATIONS

CIRCUIT BREAKERS For lighting, distribution and power circuits up to 600 amperes, the complete line of No-fuze "De-ion" circuit breakers is described in 40-page booklet DD-29-060 published by Westinghouse Electric & Mfg. Co., Dept. 7-N-20, East Pittsburgh, Pa.

CLEANING The second edition of the revised, enlarged, 40-page manual published by Oakite Products, Inc., 24 Thames St., New York, N. Y., describes new developments in handling over 43 important, commonly recurring degreasing and cleaning operations in aircraft and accessory manufacturing plants.

CONTROL Anyone faced with an automatic control problem, whether the controlled quantity is temperature, pH, conductivity or percent SO_2, will be interested in 29-page catalog N-OOA, "Micromax Electric Control," issued by Leeds & Northrup Co., 4934 Stenton Ave., Philadalphia, Pa.

DIAMOND WHEELS The 34-page illustrated price list, "Secomet Diamond Wheels," issued by J. K. Smit & Sons, Inc., 157 Chambers St., New York, N. Y., is a comprehensive booklet listing many types and sizes of resinoid-bonded and metal-bonded diamond wheels.

DRILL "The Drill Use Book," covering the correct methods of using portable electric drills and obtaining greatest efficiency and longest life from them, is offered by the Advertising Department, The Black & Decker Mfg. Co., Towson, Md.

DRIVE CONTROL A copy of 14-page booklet B-3123, "A Challenge to Designers of Drive Control," may be secured from Department 7-N-20, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. This booklet contains charts, diagrams and photographs explaining how the Rototrol regulates by transposing mechanical and electrical quantities. Typical applications are described and illustrated.

ELECTRONICS "Electronics—a New Science for a New World," issued by General Electric Co., Schenectady, N. Y., presents the general story of electronics —its past, its present, and its great possibilities for the future.

GAS ENGINES CCG gas engines are illustrated and described in Bulletin S-550-B21 offered by Worthington Pump and Machinery Corp., Harrison, N. J.

IDENTIFICATION STAMPS Bulletin S, Catalog No. 146, of Jas. H. Matthews & Co., 3942 Forbes St., Pittsburgh, Pa., illustrates and describes inspection stamps for industrial requirements.

JIG BORER Catalog No. 300 offered by the Cleereman Machine Tool Co., 400 W. Madison St., Chicago, Ill., contains 24 pages of illustrations and descriptive matter on jig borers and their accessories.

LATHE The semi-automatic, hydrafeed lathe is illustrated and described in Bulletin No. 140 issued by Sparks Machine Tool Corp., 32-34 Main St., Norwalk, Conn.

LATHE The Foster No. 5 universal ram type turret lathe is illustrated and described in the 16-page catalog published by the International Machine Tool Corp., Foster Division, Elkhart, Ind.

LATHES "Oiling the Lathe," a 19-page bulletin, No. H2, issued by the South Bend Lathe Works, South Bend, Ind., outlines a regular procedure of oiling with proper lubricants at definite intervals.

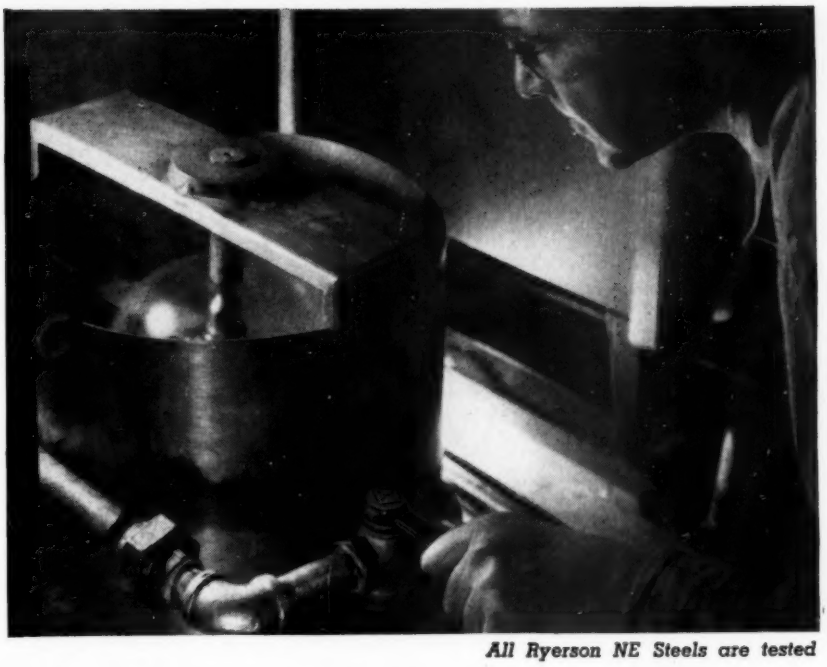
LIGHTING A folder published by The Edwin F. Guth Co., 2615 Washington Ave., St. Louis, Mo., reviews the subject "Good Lighting—Better Work" from WPB's booklet "Plant Efficiency."

LIGHTING Seven new industrial lighting units for utilization with Fluorescent lamps are pictured, described and prices and sizes are given in L-78 catalog sheets issued by The Edwin F. Guth Co., 2615 Washington Ave., St. Louis, Mo.

MILLER Bulletin MH-206 of the Globe Products Mfg. Co., 3380 Robertson Blvd., Los Angeles, Calif., illustrates and describes the Globe miller and its accessories.

MOTOR CARE Bulletin 30, issued by the Dumore Co., Racine, Wis., explains the procedure for general cleaning and overhauling of fractional horsepower motors, gives methods for cleaning and replacing sleeve bearings, ball bearings and needle bearings, and outlines care of gear units and lubrication of all parts.

MOTOR CONTROL Synchronous-motor control is the subject of illustrated, 12-page bulletin GES-1724-D issued by the General Electric Co.,



All Ryerson NE Steels are tested

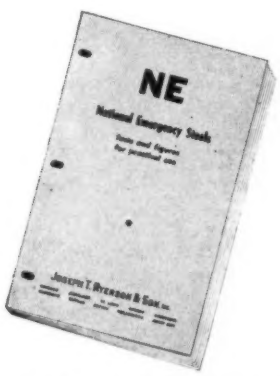
NE Alloys in Ryerson Stock

Write for New Booklet

New Technical data—including heat treatment response—is available on NE (National Emergency) Steels. Ryerson tests all NE Steels in stock. This test information is furnished with each shipment of that particular NE Steel. Thus, users can choose which of the lean-alloy steels will best replace the steels of high alloy content previously used.

Jominy End-Quench Hardenability Tests, standard for NE Steels, are a quick, reliable method of determining heat treatment response. How this test is made, the results obtained, and how to interpret hardenability in terms of tensile strength, yield point, elongation, and reduction of area, are clearly told in a recent Ryerson publication on NE Steels. Copies are available—call or write your nearby Ryerson plant.

Representative stocks of NE Steels are available at Ryerson for prompt shipment. Turnover is rapid; withdrawals are heavy, but new stocks are constantly being received. Ryerson engineers and metallurgists will gladly answer any question you may have and help you get started with NE Steels.



A HANDBOOK ON NE STEELS New, complete, authoritative! Compiled by Ryerson. If you are adapting NE Steels to your production and haven't a copy, ask for one today!

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(No. 1 in a series of WOOD & SPENCER "KNOW HOW" messages)

● Choose the right tool. The wrong tool can easily spoil a job . . . result in loss of time, material and labor. To aid you in avoiding these losses WOOD & SPENCER offers this first in a series of "know how" messages.

1. A tap ground specially for tapping steel will not do good work in brass. Therefore, choose the tap best suited to the job.
2. Taps do not cut the same size in different metals, or at different speeds in the same metal.
3. Taps measuring exactly the same size will not cut the same size if the rake of the cutting edge is different.
4. Changes in kinds of lubrication will affect results.
5. Keep taps sharp. Dull taps bind and break. Frequent sharpening will prolong life of tap.

Apply these rules to your every day work. By so doing, you will be able to produce quality work, faster, and with less waste . . . thus contributing greatly to Our Country's War Effort. Watch for future WOOD & SPENCER messages. Write for helpful information.

From customers blueprints we quite frequently make recommendations for

"THE RIGHT TAP AT THE RIGHT TIME"

The Wood & Spencer Company

Cleveland, Ohio

Schenectady, N. Y. The bulletin explains the functions performed by the various synchronous-motor controls and lists and describes several metal cabinet-type enclosures available for protecting these controls.

PRESSES E. W. Bliss Co., 53 St. and Second Ave., Brooklyn, N. Y., illustrates and describes their high-production presses in a 24-page, two-color booklet, Catalog No. 27.

PROTECTION OCD Publication 5214, "Plant Protection Fact Sheet," contains the highlights of a booklet entitled "Passive Protection for Industrial Plants" recently issued by the U. S. Office of Civilian Defense, Washington, D. C.

PUMPS Infinitely variable delivery hydraulic vane pumps, having "standard" mounting to permit them to be used as replacements for other pumps on existing equipment, is the subject of Bulletin Hy-2 issued by Hydra-Motive Inc., 723 E. Milwaukee Ave., Detroit, Mich.

SAFETY The American Optical Co., Southbridge, Mass., announces "The Safety Clipper," a publication for use by editors of employee newspapers or magazines in promoting industrial safety.

STEEL Speed Case, a new process embodying both chemical and temperature controls for the production of low carbon open hearth case carburizing steel, and Speed Treat, a medium carbon open hearth steel, are described in Bulletin 942 of W. J. Holliday & Co., Indianapolis and Hammond, Ind.

STEEL "Manganese Steel for the Steel Industry" is the title of a 47-page catalog issued by American Manganese Steel Division of the American Brake Shoe & Foundry Co., 389 E. 14 St., Chicago Heights, Ill. This catalog covers the use of manganese steel for blast furnace, coke plant, rolling mill and foundry equipment parts.

SWITCHBOARDS A revised edition of their Bulletin No. 3000 on circuit breaker and fusible switchboards has been announced by the Square D Co., 6060 Rivard St., Detroit, Mich.

TAPPING MACHINES An 8-page bulletin covering both light and heavy duty series high precision tapping machines has been released by Detroit Tap & Tool Co., 8432 Butler St., Detroit, Mich.

THERMOMETERS Wheelco Instruments Co., Harrison and Peoria Sts., Chicago, Ill., has issued Bulletins G23-2, G503-2, G603-2, G303-2 and G403-2 describing its complete line of industrial indicating, recording and control thermometers. These bulletins discuss the operating principle and give information to aid the user in selecting the proper instrument for his application.

WELDING "Arc Welding Accessories for Women," illustrated bulletin GEA-3295, issued by the Industrial Department of General Electric Co., Schenectady, N. Y., presents the complete line of safety clothing and equipment especially designed for girl welding operators.

NEW BOOKS

A COURSE IN POWDER METALLURGY—*Walter J. Baeza, president, Industrial Research Company. 209 pages. Published by Reinhold Publishing Corp., 330 W. 42 St., New York, N. Y.* $3.50.

Powder metallurgy has developed rapidly during the past few years. The future will no doubt see the extended use of powdered metals, and the data presented in this book should be of interest to those contemplating their application. The book, divided into three sections, will be valuable as a source of material for instructors, a textbook for students, and as a guide to industrial organizations planning a research or development laboratory.

The first section covers material comprising a series of lectures on the history of powder metallurgy, and on laboratory and plant processes. The theory underlying these processes is described. Methods of classifying powders and their limitations, as well as laboratory procedures for examining both powders and products, are fully treated.

The second section gives practical suggestions for assigning experiments to students, in which a minimum of equipment serves a maximum number of students. Necessary equipment and materials, together with their cost, are listed.

Fifteen experiments are outlined in the third section. Each experiment can be performed by students in one or two, four-hour laboratory periods. In addition to describing the object, the method of procedure, and equipment needed for each experiment, the significance of the experiment, and its relation to the series discussed in earlier chapters are indicated.

•

PRESS TOLLS—*Prepared by a staff of technical experts under the direction of E. Molloy. 108 pages. Published by the Chemical Publishing Company, Inc., Brooklyn, N. Y.* $2.50.

Recent developments in the pressing and stamping of steel, brass and other metals into new and wider varieties of forms constitute the subject matter of this new book. The five chapters cover forging and pressing, the machining of dies and molds, shearing metal, drawing cylindrical shells, and press tool computations. Under the first head is included not only drop stamping and forging, but also die casting and plastic molding. It also includes a large section on die design. Chapter II covers

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Get behind the counter and try to allot our scarce materials. Then you'll realize that Uncle Sam is in a tough spot . . . to help him you'll have to help yourself.

Whether it's copper or coffee that's going into your basket, Uncle Sam is forced to say: "*Mister, you must make the most of it.*"

In an effort to put this tremendous task into operation, the Controlled Materials Plan (CMP) has been initiated . . . with this objective: "To utilize the available National supply of critical materials so as to be sure of getting the largest and most *war-useful* production."

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To help our clients . . . all now in war production . . . co-operate with Uncle Sam in "*making the most of it*" is an obligation our organization gladly accepts. Can we be of assistance to you?

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the various special machines used in making dies and molds, including such specialized tools as die mills, pantograph mills, duplicating machines and punch shapers. Special attention is given to rotary hand tools.

The most useful portion of the book is the section on press tool computations. This gives all necessary formulas, charts and tables for blanking, shearing, drawing, reducing, ironing, coining, sizing, and forging, as well as the selection of presses, shaft constructions, power and tonnage required.

•

FUNDAMENTALS OF MACHINES FOR THOSE PREPARING FOR WAR SERVICE—*By Glenn M. Hobbs, W. M. Welch Manufacturing Company, L. H. Morrison, author of "Diesel Engines—Operation and Maintenance," and Ray F. Kuns, principal, Automotive Vocational High School, Cincinnati. 294 pages. Published by American Technical Society. Chicago.* $2.

This volume in the publisher's Preinduction Training Series is devoted about equally to practical physics and internal combustion engines, and includes a chapter on block and tackle. It is designed to prepare men for ratings as tank engine mechanics, drivers, or commanders; driver of scout car, reconnaissance car, ambulance, wrecker, or motor-cycle; portable power operator or repair man; power turret maintenance man; bridge foreman; truck master; demolition specialist; mine planter; searchlight operator; artillery mechanic; aerial engineer; or non-commissioned officer in motor transportation.

Much of the material is drawn from other publications of the society. It is abundantly illustrated and clearly presented. A workbook is published to accompany the text.

•

NATIONAL FIRE CODES FOR EXTINGUISHING AND ALARM EQUIPMENT, 1943—*Compiled by Robert S. Moulton, technical secretary, N.F.P.A. 669 pages. Published by National Fire Protection Association, Boston. $3.*

This volume brings together for convenient reference the many N.F.P.A. standards dealing with the various types of fire extinguishing and alarm equipment, and related features of supervision, maintenance and organization, including special provisions on equipment differing from the general standards, such as the protection of piers and wharves. These codes are purely advisory but are widely used as a basis of law or as a guide by administrative authorities in the exercise of their discretionary power.

In all, this edition includes sections on automatic sprinklers and water supply, extinguishers and hose, chemical and other special systems, public protection, alarm and supervisory systems, employee organization and on the special fields of mine equipment, handling

motion picture film, handling pyroxylin plastics, explosive dusts, etc.

No specific equipment is described or recommended. The standards are prepared in terms of required performance, avoiding specifications of materials, devices or methods which would preclude obtaining the desired results by other means.

•

INDUSTRIAL RADIOLOGY, X-RAYS AND GAMMA RAYS—*By Ancel St. John and Herbert R. Isenburger. Second edition. 298 pages. Published by John Wiley & Sons, Inc. New York. $4.*

This book was originally published in 1934 under the title "Industrial Radiography." The title change indicates some of the alteration that has been made in the text. Since radiographic inspection has made great advances since 1934, a large part of the new material concerns equipment and accessories, describing the latest developments and improvements in tools and technique without enlarging too much on details and special applications. However, a completely new chapter on "Industrial Fluoroscopy" has been added.

The book is aimed at students, laymen and engineers who want to know something of the basic theories involved in the subject. No attempt has been made to produce a scientific treatise. However, the subject is given a full treatment. The first several chapters give the history of X-ray development, a detailed though not exhaustive summary of the physics involved, and a description of the types of equipment used. The last half of the volume discusses the problems in radiography raised by different types and shapes of work.

The material is clearly presented and adequately illustrated. A bibliography containing 1,314 items is included.

•

RESISTANCE WELDING MANUAL—*Published by the Resistance Welder Manufacturers' Association, 505 Arch St., Philadelphia. 286 pages. $2.50.*

The recognized need for an accurate, comprehensive and practical reference book in which factual data about resistance welding processes are made readily available, resulted in publication of this new manual. It is the collaborative work of 38 specialists under the editorial direction of E. J. Del Vecchio of the Taylor-Winfield Corporation, chairman of the Subcommittee to Prepare Material for the Handbook of the American Welding Society.

The material is divided into five chapters and a section of definitions and symbols. The opening section covers the fundamentals, including general theory, economics, power supply and electrical and mechanical characteristics. Spot, projection, seam, butt and special weld-

Save scrap to beat the Jap—to hurry Hitler to defeat. Save time and manpower with mechanized material handling. Put Standard Conveyors and Standard equipment to work . . . to convey . . . lower . . . lift . . . pile . . . or tier materials and merchandise in your plant.

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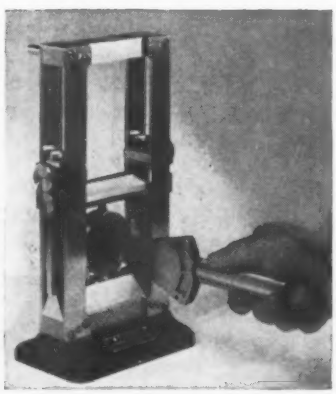

ing processes and techniques are treated in the largest chapter, which presents descriptive, illustrative and tabular material on all types of welds. Under the head "Resistance Welding Machines" the third chapter offers information about installation and servicing, performance details, and attachments for all standard machines. The subject is completed with chapters on "Controls and Timing Devices" and "Electrodes, Electrode Holders and Conductors."

The material is illustrated with halftones, line drawings, wiring diagrams and statistical graphs. Essential tables are distributed through the text at appropriate places. The index, however, would seem to be inadequate for a reference volume.

•

MACHINE SHOP SCIENCE AND MATHEMATICS —*By Joseph J. Eaton, formerly director of vocational education, Yonkers, N. Y., and Albert V. Free, instructor of science, Saunders Trade School, Yonkers, N. Y. Revised edition. 187 pages. Published by The Manual Arts Press, Peoria, Ill.* $2.

This is the third edition of a volume that first appeared in 1926. The present version has been revised in the light of its use as a classroom text. It is designed for use by vocational students. The material covered is the elementary physics, chemistry and mathematics involved in machine shop work. It is presented in the simplest language with an abundance of examples and problems.

Books for the Armed Forces

Men in military service want and need books now. On the lighter side they have shown a preference for current best sellers, adventure, detective, mystery, sea and western yarns, and humor in any form. But, since the large majority of them are not professional soldiers, they hope some day to resume the interests and responsibilities of civilian life. Many of them are planning for that day and want to do now whatever they can to prepare for it.

That is why the Victory Book Campaign, which is sponsored by the American Library Association, American Red Cross and United Service Organizations, is asking for technical books published since 1935 in the fields of architecture, aeronautics, chemistry, drawing, machine design, mathematics, meteorology, navigation, photography, physics, radio, shop mechanics, civil and mechanical engineering. Books like these will help our men be better soldiers and better civilians. So get them off your shelves and get them to your local library where facilities are available to collect them, sort them, and ship them off to the men on the fighting front.

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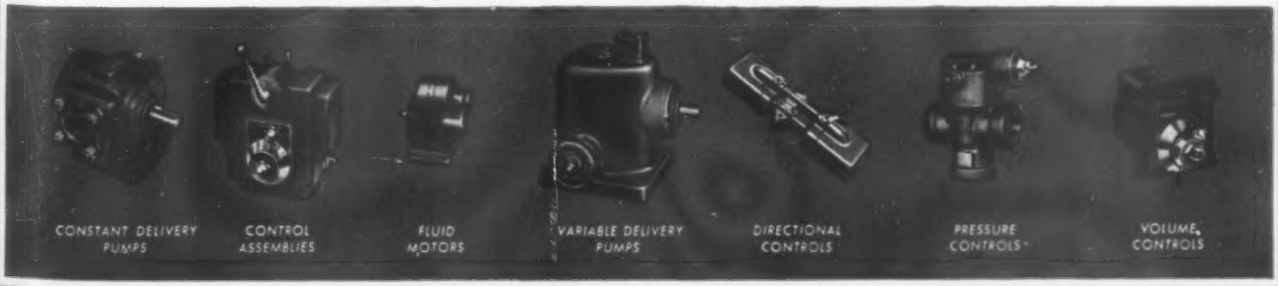

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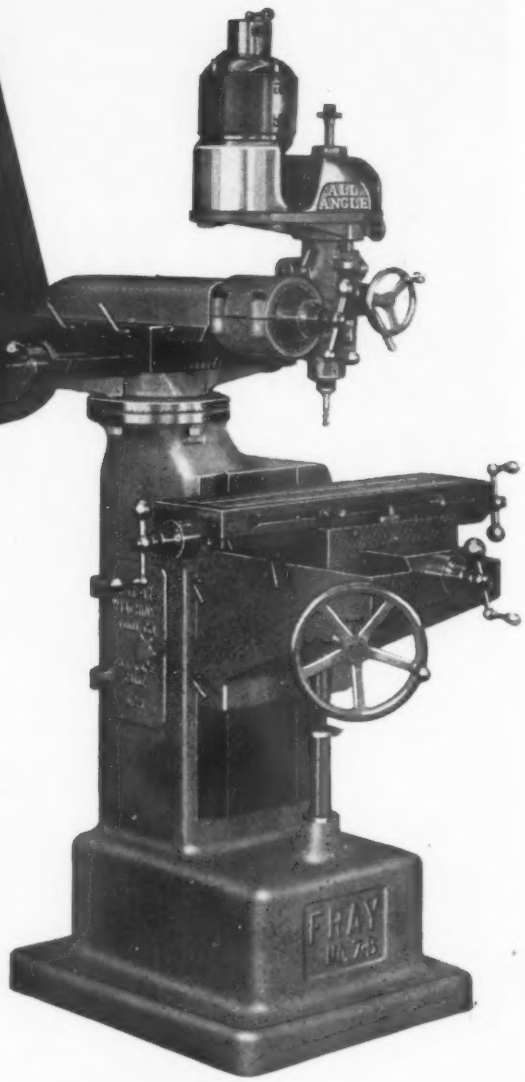

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Without changing the work set-up, machining operations can be done at any angle in either or both the vertical and horizontal planes. All movements of the head are accurately controlled with calibrated dials. The maximum of flexibility desired by tool makers is a feature of the Fray No. 7-B Machine.

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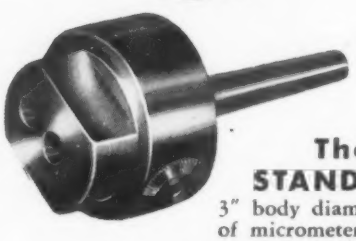
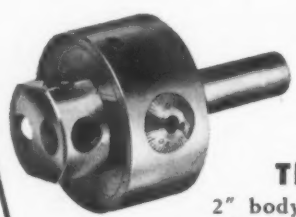
Hundreds of firms now have Fray Boring Heads in their tool cribs for FAST, PRECISION WORK. Time is saved and guess work eliminated with the calibrated off-set adjustment dial. Three tool holes provide wide flexibility of service, with only two boring bars. Exclusive design maintains accuracy.



The STANDARD

3″ body diameter... ½″ of micrometer offset adjustment... dial set flush with 50 graduations of .001″ each... shank tapered and tapped for draw-in bolt... No. 7 Brown & Sharpe or No. 2 Morse taper arbors standard (special arbors furnished on request)... two ½″ boring bars furnished with Head.



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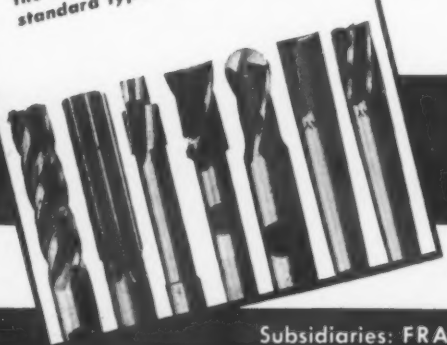
2″ body diameter... 5/16″ of micrometer offset adjustment... dial calibrated in .001″... straight shank... two ⅜″ boring bars furnished with Head.

Users of FRAY Milling Machines and All-Angle Milling Attachments are ASSURED of a dependable source of End Mills, through the Fray Tool & Reamer Co. All standard types and sizes.



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Magnesium, the extraordinary weight-saving metal that today lightens the burden of our fighting planes, is also a symbol of things to come. Designers are eager to extend its use when Victory brings release—to fill peaceful airways with freight transport freed of dead weight—to take full advantage of magnesium's lightness in the construction of products for factory, office and home.

Dow, major producer of magnesium, will be ready when that day of transition arrives—ready to cooperate as a source of magnesium ingots, fabrication facilities and engineering service.

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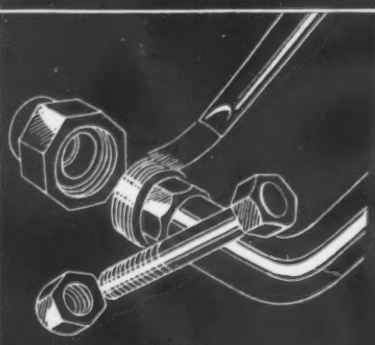

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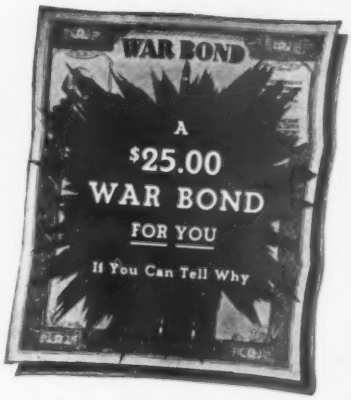

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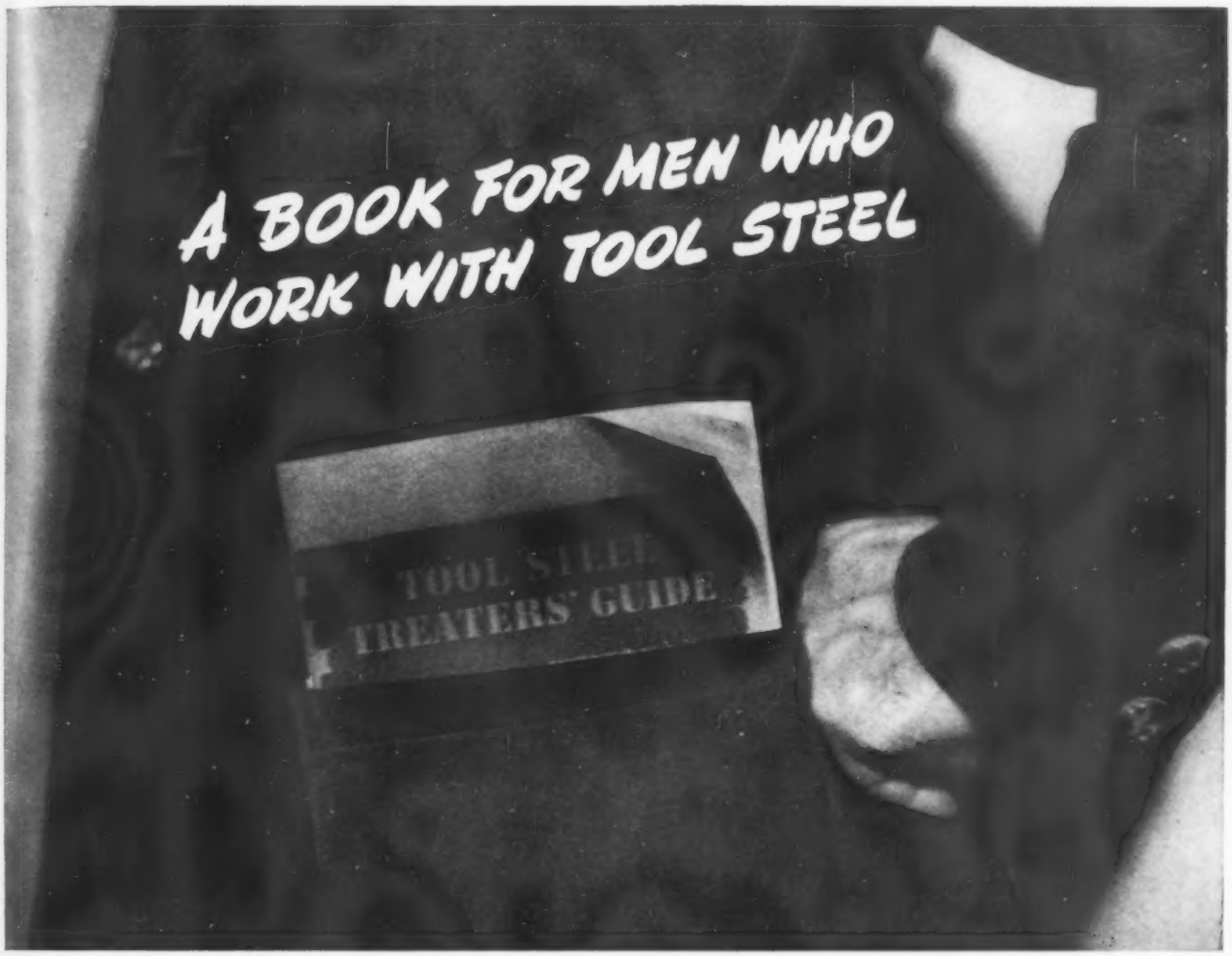


This little handbook, *Tool Steel Treaters' Guide,* is meant for practical men who work with tool steel. The book contains useful facts, simply and plainly set forth.

For example, there are full general instructions on the handling of tool steel. Practical information on forging, normalizing, annealing, spheroidizing, grinding, machining, cooling, quenching and tempering.

There are many charts and photographs. Heat-color and temper-color charts are printed in full natural color, so that by comparing them to a piece of hot steel, you can tell approximately what its temperature is. There are micrographs of tungsten high-speed steel, showing the effects on grain size of holding at quenching temperature for different lengths of time . . . photographs of hot acid-etch test samples . . . and dozens of other practical illustrations covering tool-steel treatment.

One section of the book is devoted to hundreds of definitions commonly used in the steel industry. These definitions should prove especially useful to new men getting into the metal-working field.

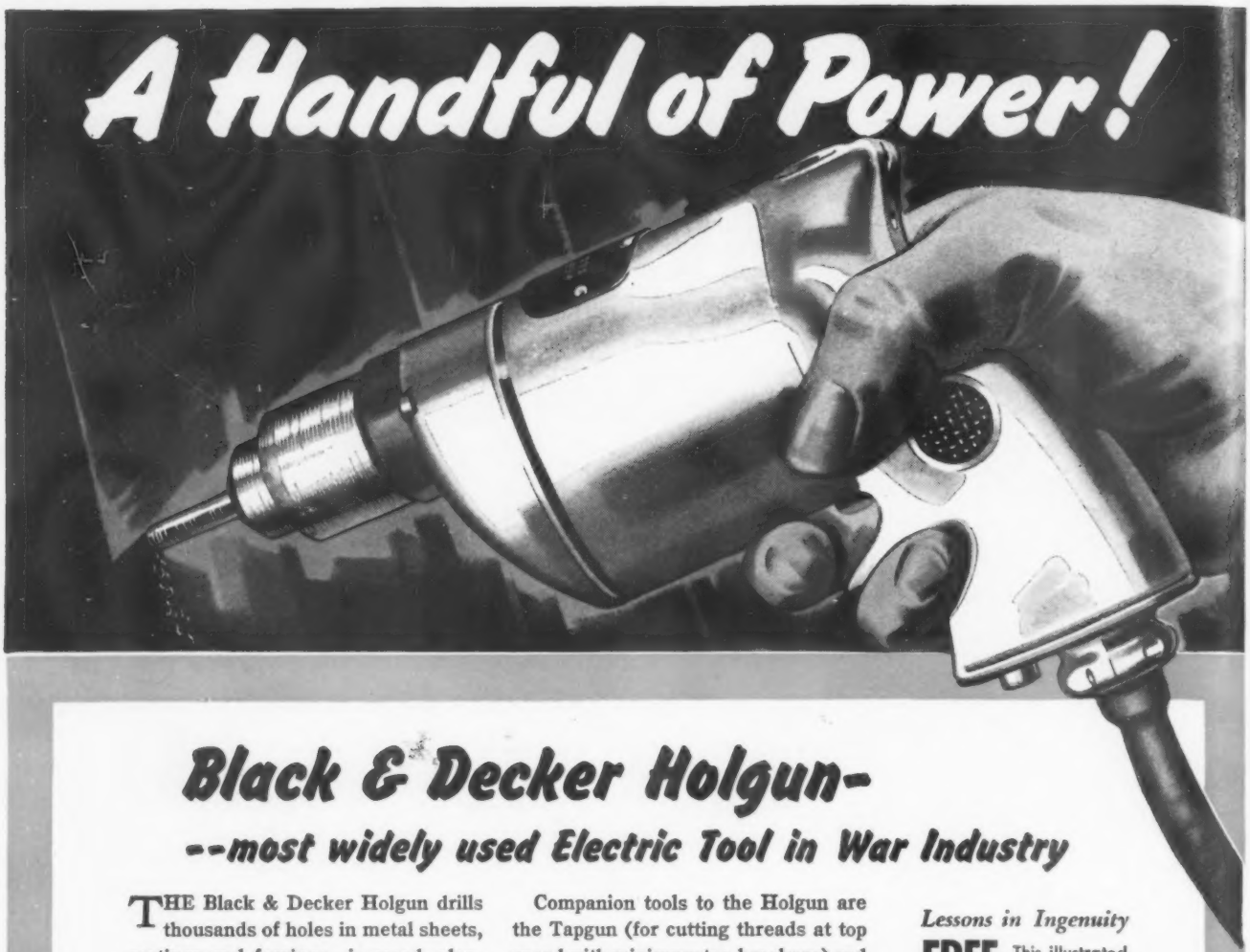
The last section of *Tool Steel Treaters' Guide* is made up of useful tables. Weights and areas of different sections of bars. Hardness- and Temperature-conversion tables. Equivalents of the various metric units in terms of inches and feet.

If you work with tool steel, and feel you could use this kind of information to good advantage, write to Bethlehem Steel Company, Bethlehem, Pa. We'll send you a copy of *Tool Steel Treaters' Guide* without any cost or obligation whatsoever.

BETHLEHEM STEEL COMPANY

BETHLEHEM STEEL

A Handful of Power!



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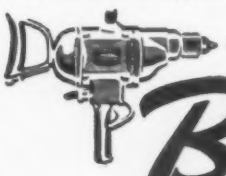
Companion tools to the Holgun are the Tapgun (for cutting threads at top speed with minimum tap breakage) and the Scrugun (for making short work of screw driving and nut running operations). Such jobs as these—drilling and tapping, screw driving and nut running, grinding and sanding, sawing and sheet metal cutting — are among the countless jobs on which Black & Decker Portable Electric Tools are saving vital hours in war production now.

Lessons in Ingenuity

FREE This illustrated booklet shows how ingenious war producers have combined brains with Black & Decker Tools —when special equipment could not be had to keep vital production rolling. It's called, "They Used Their Heads," and a copy is yours for the asking. It's chock-full of information and ideas. Write: The Black & Decker Mfg. Co., 716 Penna. Ave., Towson, Md.



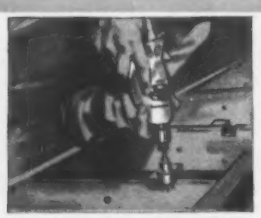
LEADING DISTRIBUTORS EVERYWHERE SELL

Black & Decker

PORTABLE ELECTRIC TOOLS

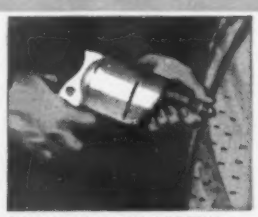
Get in the Scrap with Your Scrap Now!

WINGS FOR VICTORY. Husky B & D Holguns speed drilling operations on airplane wing parts. There are more Holguns used in the aviation industry than any other electric drill.



BOAT FRAMES ARE NOTCHED quicker with this ¼" Holgun, specially equipped with a multi-spur. These versatile tools help solve many new wartime production problems.

TAPPING GOES ⅓ FASTER with Black & Decker Tapgun than by former method, reports plant operator. The Tapgun saves time, labor—keeps running on hard schedules.



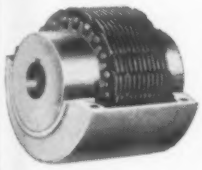
THOUSANDS OF SCREWS on thousands of boats are driven faster and more accurately when B & D Scruguns go to work. The Scrugun is widely used in small boat production.

"ELECTRIC MOTOR production speeded up with Black & Decker Scruguns," says motor manufacturer. On all multiple screw driving or nut running operations, Scruguns save time.

So It's Couplings You Need?

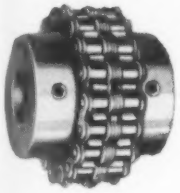
See MORSE

Wide variation of sizes and designs to fit every coupling application



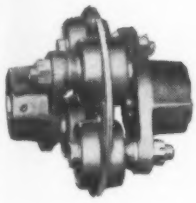
Silent Chain Couplings

Easy to connect and disconnect, rugged and flexible, cushions shock loads and dampens vibration, machined finished faces for easy check-up and alignment. Enclosed in split, easily removable lubrication covers.



Roller Chain Couplings

All steel, two sprockets—one mounted on each shaft—wrapped by improved Morse Roller Chain. Easy to install and align, revolving cover available for smaller sizes, stationary cover for larger sizes. Special types, shearing pin, split hub and clamp hub can be supplied.



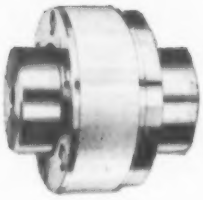
Morflex Couplings

Contain two steel hub members and a floating center unit assembly to which each hub is separately connected through resilient rubber trunnion blocks. There is no metal on metal movement. Rubber allows for maximum distortion without loss of efficiency. Cuts maintenance cost.

★

Morflex Radial Couplings

Sustain thrust and torsional loads. For heavy torque loads and for drives subject to shock or high frequency load reversals. Use specially shaped rubber trunnions. Entire unit machined all over to insure perfect balance.

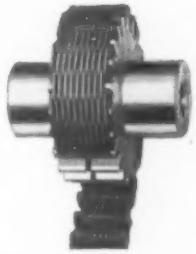


Free Wheeling Clutch Coupling

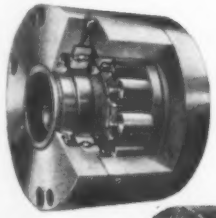
For coupling two shafts for high or low speed free wheeling. Morse Chain wrapped coupling integral part of clutch. Adapts the Morse full line of free wheeling clutches to tandem or endwise application.

Silent Chain Accessory Coupling

Comprised of two flanges with special sprocket teeth wrapped with a silent chain. Provides a semi universal action and allows slight parallel misalignment without exerting overload on adjacent bearings. Chains easily removed for servicing.



MORSE CLUTCHES



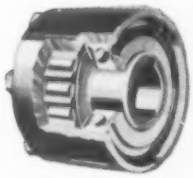
Free Wheeling Clutch

For wide diversified range of uses—indexing brake, back stop and dual drive service—wherever there is need for alternate or intermittent power between one or more prime movers coupled to driven members, positive locking action, high or low speed service.

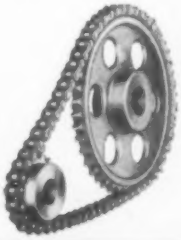
★

High Torque Indexing

Instant positive action of the spring-actuated cams of this inexpensive clutch makes it ideally suited to ratchet feed mechanisms where accuracy of indexing is essential. Insures closer indexing tolerance and increased number of strokes per minute.



Morse precision products also include silent and roller chain drives, sprockets, chain couplings, Morflex Couplings, Radial Couplings, Pullmore clutches, automotive timing chains and marine drives.



SILENT CHAINS ROLLER CHAINS FLEXIBLE COUPLINGS CLUTCHES

MORSE *positive* DRIVES

MORSE CHAIN COMPANY ITHACA, N. Y. DETROIT, MICH. DIVISION BORG-WARNER CORP.

PHYSICAL PROPERTIES OF "BAKELITE" PLASTICS

that mean Fighting Strength

THE SEVERE SERVICE under which equipment must operate today puts heavy demands on plastic materials. In many instances, plastic parts must possess not only high tensile strength, but impact resistance and hardness as well. Other parts may require high flexural strength combined with dimensional stability and wear and abrasion resistance. Thus the designer and engineer, in selecting plastics, must constantly keep in mind the correct balance of *all* these physical properties.

The problem may be the selection of a BAKELITE Plastic material possessing high impact resistance, with tensile or flexural strength requirements running a very close second. On the basis of impact resistance alone, it might seem advisable to choose a high-impact BAKELITE Phenolic Molding Material. But such a material might not meet tensile strength requirements! On the other hand, a general-purpose BAKELITE Phenolic that possesses the required tensile strength can have as little as 1/18 the shock resistance of the high-impact material! In such a case, final choice of material may lie between the two extremes.

The design of the part has a lot to do with its ultimate strength characteristics. Frequently, BAKELITE Molding Boards and Blanks are used in conjunction with general-purpose phenolic plastics to provide reinforcement around inserts, and at corners, shoulders, and other points that are subjected to severe service. Mechanical strength may also be improved by increasing wall thickness, or by making adjustments in fabricating techniques.

Apart from these physical properties, mechanical strength can also be interpreted in terms of *toughness*, particularly with flexible plastics that are not usually tested for impact resistance. *Mechanical fatigue* may also become a major problem where plastics are placed under load, or are subjected to repeated blows, or to continued flexing.

On the facing page are presented the outstanding physical properties of those BAKELITE Plastics of primary importance to war production. Later messages will deal with the chemical, electrical, and thermal properties. For more detailed information write for a copy of Booklet 1— "A Simplified Guide to BAKELITE Plastics."

BAKELITE CORPORATION, 30 E. 42nd St., New York
Unit of Union Carbide and Carbon Corporation

UCC

BAKELITE

PLASTICS HEADQUARTERS

Physical Properties of "Bakelite" MOLDING MATERIALS

Thermosetting General-Purpose Phenolics

These materials provide well-balanced combinations of dimensional stability and other physical properties suitable for everyday requirements. *Impact strength:* 0.26 to 0.40 foot-pounds per inch of notch (Izod). *Tensile strength:* 6,500 to 8,500 pounds per square inch. *Flexural strength:* 8,800 to 13,000 pounds per square inch.

Thermosetting Shock-Resistant Phenolics

Four types, offering a wide range of physical properties. All types are dimensionally stable, and resistant to wear and abrasion. Depending upon type, *impact strength:* from 0.46 to 5.4 foot-pounds per inch of notch (Izod); *tensile strength:* from 5,300 to 8,500 pounds per square inch; *flexural strength:* from 6,300 to 11,000 pounds per square inch.

Thermosetting Phenolic Molding Boards and Blanks

These are medium-high, impact materials that may be used in molds built for general-purpose phenolics. Can be used alone, or with other plastics to provide reinforcement at vital points. Supplied as board stock or as blanks approximating shape of finished part. Also sold in diced form suitable for automatic preforming. Depending upon type, *impact strength:* from 1.6 to 2.0 (with grain) and 0.6 to 0.9 (against grain) foot-pounds per inch of notch (Izod); *tensile strength:* from 3,000 to 11,000 pounds per square inch; *flexural strength:* from 8,400 to 25,000 pounds per square inch.

Special Phenolics

This group comprises a variety of dimensionally stable, thermosetting materials, for special requirements of heat resistance, low power factor, chemical and water resistance, low friction coefficient, opacity to X-rays, and transparency.

Thermosetting Ureas

Most color stable and hardest of all thermosetting plastics. *Impact strength:* from 0.30 to 0.36 foot-pounds per inch of notch (Izod); *tensile strength:* from 9,500 to 12,000 pounds per square inch; *flexural strength:* from 10,000 to 14,000 pounds per square inch.

Thermoplastic Cellulose Acetates

Two types—Class I, general purpose, for compression and injection molding, and Class II, heat- and water-resistant, for injection molding only. Both types noted for high impact strength, toughness, and wide color range. *Impact strength:* from 1.4 to 4.0 foot-pounds per inch of notch (Izod); *tensile strength:* from 2,500 to 9,500 pounds per square inch; *flexural strength:* from 5,000 to 15,000 pounds per square inch.

Thermoplastic Polystyrenes

Outstanding in dimensional stability, chemical resistance, and dielectric qualities. For compression as well as injection molding. Supplied as crystal-clear material, and in transparent and translucent colors. *Impact strength:* from 0.40 to 0.70 (compression-molded), 0.8 to 1.2 (injection-molded) foot-pounds per inch of notch (Izod); *tensile strength:* 5,500 to 6,500 (compression), 6,500 to 7,000 (injection) pounds per square inch; *flexural strength:* 6,500 to 7,500 (compression), 14,000 to 19,000 (injection) pounds per square inch.

Physical Properties of Laminated Plastics made with "Bakelite" LAMINATING VARNISHES

BAKELITE Laminating Varnishes are used in the production of paper-base and fabric-base laminated sheets, tubes, and rods. Laminated plastics made from these varnishes possess excellent dimensional stability, high impact, tensile, and flexural strength, and are extremely resistant to wear and abrasion. In addition, they offer an unusual combination of other properties such as high dielectric strength, resistance to corrosion, and immunity to water, brine, oil, ordinary solvents, most acids, and weak alkalies.

Physical Values

Tensile strength of standard paper-base grades ranges from 7,000 to 12,500 pounds per square inch; flexural strength (transverse), from 15,000 to 21,000 pounds per square inch; and compressive strength, from 22,000 to 36,000 pounds per square inch. For standard fabric-base grades, tensile strength ranges from 8,000 to 10,000 pounds per square inch; flexural strength (transverse), from 17,000 to 20,000 pounds per square inch; and compressive strength, from 35,000 to 38,000 pounds per square inch.

Sheets, Rods, Tubes, Special Shapes

Laminated sheet stock and gear stock is supplied by laminators and fabricators in various thicknesses and sizes. Tubing can be obtained in lengths from 36 inches, with I.D. from 3/16 of an inch to 72 inches. Larger tubing can be made for special requirements. Rods come in standard lengths up to 48 inches, and in diameters from 1/8 of an inch to 4 inches. Special shapes are made to order.

Special Types

In addition, special laminated plastics have been developed for specific mechanical requirements. Molded-laminated plastics permit the manufacture of such unusually tough and wear-resistant products as heavy-duty bearings. Rubber-laminated plastics combine the rigidity and mechanical strength of laminated plastics with the vibration-absorbing qualities of the rubber interlayer. Tough, densified-laminated woods also are made possible by impregnating wood veneers with a laminating varnish and subsequently applying heat and pressure.

Physical Properties of "Bakelite" BONDING MATERIALS

Phenolic and Urea Resin Wood Glues

For bonding plywood and other wood products. Glue line is dimensionally stable under extreme conditions of heat, cold, moisture, and impact shocks. Bonded woods are resistant to mould growth.

Resin Cements for Lamp Basing

Because of their dimensional stability when subjected to heat, BAKELITE Resin Cements are used widely to set electric light bulbs and radio tubes in their metal or plastic bases. Mechanical shock or vibration does not impair the bond.

Resin Cements for Bristle Setting

A tough, tenacious bond for bristles used in brushes of all types is provided with BAKELITE Resin Cements. The bond obtained is unaffected by constant use, or by frequent cleaning in water or solvents.

Bonding Resins for Glass and Mineral Wool

To form glass, rock, and mineral wool into easily handled, dimensionally stable insulation batts, the fibers are bonded together with BAKELITE Resins. Heat cold, and moisture do not affect bonding strength.

Bonding Resins for Abrasive Products

Abrasive grit used to form high-speed grinding and cut-off wheels is securely bonded with BAKELITE Resins. This tough, strong bond has made it possible to operate grinding wheels safely, at speeds considerably higher than with other bonds.

Resins for Brake Linings

Both woven and molded brake linings are processed with BAKELITE Resin for greater toughness, dimensional stability, and resistance to wear and heat.

Physical Properties of SURFACE COATINGS *made with "Bakelite" Resins*

BAKELITE Synthetic Resins, when formulated into protective coatings, provide such properties as durability, faster drying speed, toughness, hardness or flexibility, resistance to wear and abrasion, and resistance to water and chemicals.

Phenolic Resins

For fortifying paints, primers, varnishes, and enamels of all types. Outstanding are the para-phenyl-phenol type of resins BR-17000 and BR-254, which have established new standards of durability for government and industrial specification coatings. Numerous other BAKELITE Phenolic Resins are serving widely diversified coating requirements. Certain types are used to fortify non-phenolic coatings to improve performance.

Dispersion Resins

These resins provide coatings with an unusual combination of properties—extremely fast drying time and maximum resistance to moisture. Such coatings dry as fast as *one minute*, entirely by solvent evaporation, without need of baking treatment. Because they are non-oxidizing, they do not become brittle after long years of service. They are especially useful as primers for ferrous and non-ferrous metals, particularly aluminum and magnesium alloys.

Baking Resins

For hard, abrasion-resistant coatings for lining cans, drums, and tanks. Baked on immediately after application, they provide high resistance to heat, chemicals, and moisture. Equipment need not be dismantled nor shipped out of the plant; the coatings can be applied, *right on the job*, by means of special, portable baking apparatus.

C-9 Resins

For coatings on cloth, paper, concrete, plaster, brick, plastics, wood, and metal, these versatile resins contribute many unusual physical properties. They are noted for their adhesion and long retention of flexibility. In wet scrub tests, water-emulsion paints made with them far exceed durability required in government specifications. Baking enamels based on them do not blister or flake even when immediately plunged into cold water after long baking.

Physical Properties of "Bakelite" IMPREGNATING, SEALING, and CALENDERING MATERIALS

Calendering Resins for Cloth

Cloth calendered with BAKELITE Resins gains added toughness with little or no sacrifice in flexibility. The resins impart a high order of resistance to water, chemicals, and heat.

Resins for Wood Densifying and Stabilizing

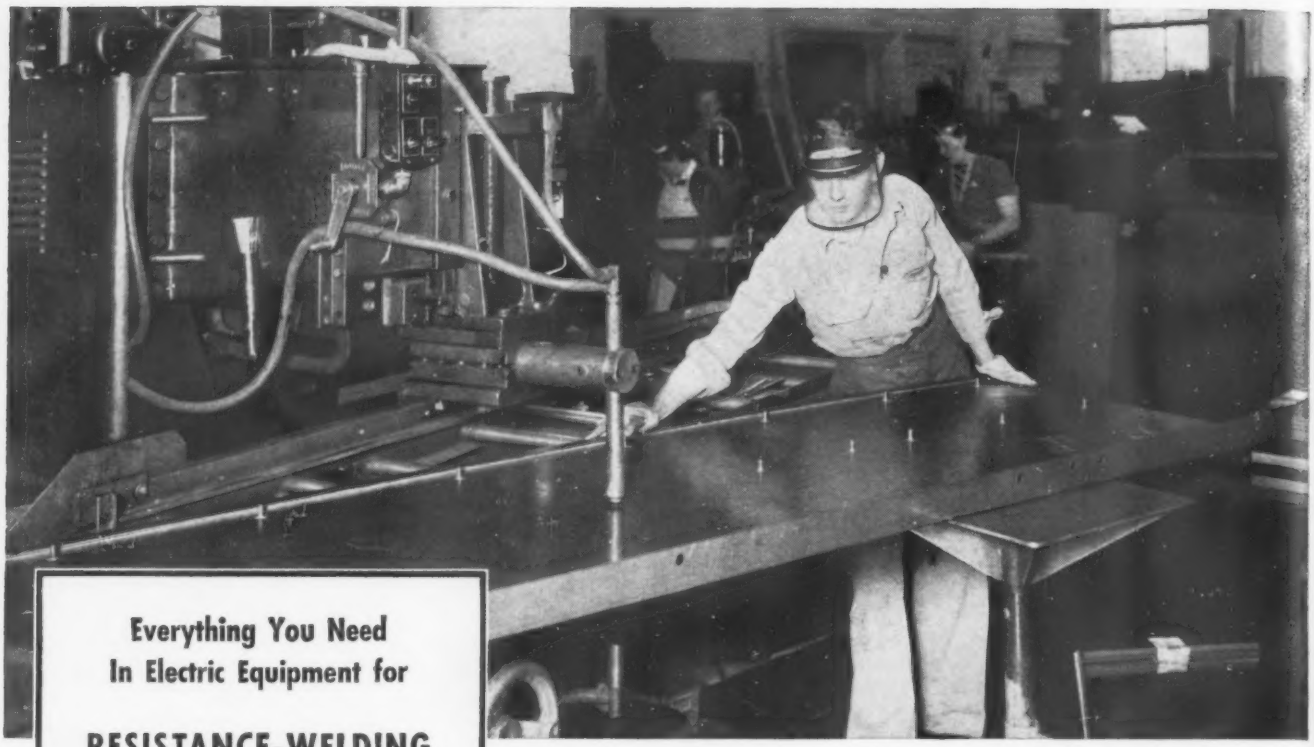
The many important advantages of wood are supplemented by high mechanical strength and excellent resistance properties when impregnated with BAKELITE Resins. In particular, the moisture content of wood veneers can be stabilized by such treatment. Impregnated veneers can be compressed into densified wood, known as "compreg," with specific gravity up to 1.37. On parallel-grained specimens, modulus of rupture can reach 38,000 pounds per square inch (with grain), and compressive strength 25,000 pounds per square inch (with grain). "Compreg" is fire retardant, has excellent aging properties, and is resistant to sulphuric and hydrochloric acid solutions.

Sealing Solutions for Castings

Castings ordinarily rejected for porosity and small blowholes are reclaimed by forcing BAKELITE Sealing Solutions into the pores under pressure, and then baking. The sealing solution thus becomes exceedingly hard and tough, unaffected by hot or cold water, steam, oils, chemicals, or heat up to 400 deg. F.

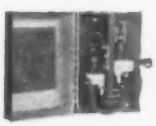
Impregnating Varnishes for Windings

As protective coatings and insulating bonds for coils, armatures, and windings, BAKELITE Varnishes remain stable and hard despite elevated operating temperatures and high rotational speeds. Better mechanical strength is also obtained.



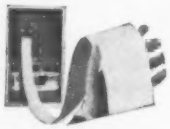
Everything You Need In Electric Equipment for

RESISTANCE-WELDING MACHINES



Electronic controls for spot and seam welders

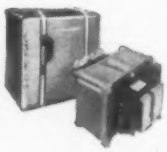
Electronic weld and sequence timers



Weld-recorders—to record electrical input of EVERY weld

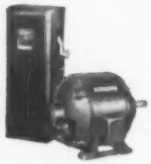
Electron tubes for all purposes

Cables and instruments



Air circuit breakers and welding transformers

Capacitors for power-factor improvement



Motors and control

How Spot-welding

SAVED 6 OPERATIONS

in Mounting These Studs

Today—

Insert a stud in the electrode and press the foot-switch. Before your foot returns to the floor, the weld is completed—strong, tough, *fast*. Stud and panel become *one piece* in *one operation*. Yesterday, before spot-welding took over, each stud took *seven operations*.

The Old Way—

Drill a hole, tap it, countersink it, screw in the stud, peen it (so it won't turn), grind off the rough surface, fill the stud head. *Seven* long steps. With 7 tools. But you can *spot-weld* a stud to that panel in the wink of an eye.

Resistance welding with precise electronic control is speeding the construction of light-metal and stainless-steel aircraft. Replaces soldering operations, too, saving tin and time. Joins like or unlike metals or alloys. Gives dependable, consistent results.

It makes gas-tight seams. Saves materials. Simplifies design problems. Relieves the shortage of skilled operators. Resistance welding is ideal for high-production operations on heavy or light work, portable or fixed, with men or women operators.

Whatever your application, be sure to specify G-E *electronic* control and electric accessories with your resistance-welding machine. For further information, contact any G-E office, your resistance-welding machine manufacturer or agent, or write Electronic Control Section, General Electric, Schenectady, N. Y.

Speed Production Electronically

GENERAL ELECTRIC

645-22-8960

We found a way to out-fox the Axis

WHEN THEY CORNERED SWEDISH SPRING STEEL

THINGS looked serious when Hitler shut off shipments of steel from Sweden. Valve springs—so all-important to the efficiency of automotive engines—were made largely from Swedish steel wire rods. Manufacturers swore by the Swedish product—thought nothing could take its place.

Faced with this situation, our metallurgical experts went to work and developed a domestic valve spring steel not only equal to the finest Swedish product, but *better*. Today our plants are making huge tonnages of this steel by the Open Hearth process, employing closely controlled heat treatments and newly developed wire-making practices. The Axis has been out-foxed again—they failed to put a crimp in America's automotive production.

Valve springs made from this domestic steel are giving superb service in the hard-working motors of American trucks, tanks and jeeps. Even in the stepped-up requirements of war service they are doing an outstanding job.

Production of this superior valve spring steel was no lucky happenstance. It was possible because of our long experience, as America's largest wire makers, in making high grade steels.

This wire-making "know-how" has helped solve one tough war problem after another. From this unequalled background and the accelerated progress of these war years, will come new and finer products to serve you in the coming years of peace.

AMERICAN STEEL & WIRE COMPANY

Cleveland, Chicago and New York

United States Steel Export Company, New York

Wire for War Products

COLD FINISHED STEEL BARS · COLD ROLLED
STRIP STEEL · MANUFACTURERS' WIRES
STAINLESS STEEL · SPRING WIRE
WELDING WIRE · WIRE SPRINGS

UNITED STATES STEEL

A Quick, Smooth, Uniform coating — assured by
BARRETT GALVANIZING AND HOT TINNING CENTRIFUGALS

BARRETT CENTRIFUGAL GALVANIZER is driven with high torque head and has an equalized disc brake for quick stop.

With these new Barrett machines for expelling excess metal from small parts after dipping in molten metal, faster and better work is assured which will pass the most rigid inspection for quality.

The method of handling work is simple and easy. Work to be processed is placed in a basket and submerged in a kettle of hot molten metal. When thoroughly heated, the basket with the work is transferred into the Barrett Centrifugal where the basket is revolved and the excess metal thrown from the work. A quick pick up and stop (from 2 to 3 seconds each) assures fast work. Then too, quick pick up snaps the excess metal from the work before centrifugal action comes into play. With Barrett Equipment excess molten metal can be quickly thrown off before the metal cools, thereby assuring smooth, even thickness of coating.

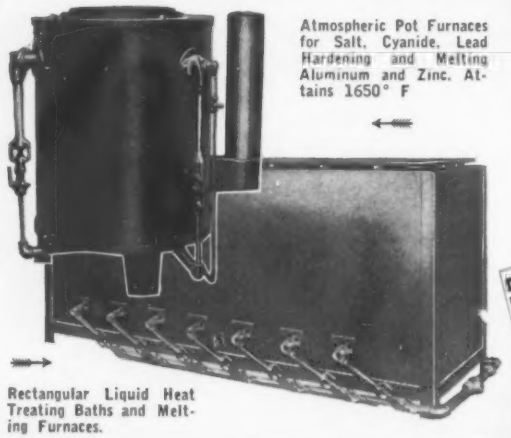
Barrett Centrifugals for Galvanizing with and without heated drums are available in capacities from 40 to 240 loads per hour handling from 5 to 100 lb. loads. For tinning, Barrett offers the #0 Centrifugal Machine, operated similarly to the Galvanizers. On threaded work, tinning is so exactly done that rethreading is unnecessary.

Barrett Galvanizers, combining convenience of operation with the utmost in speed and safety are developed to meet the requirements of actual use by men thoroughly familiar with this class of work. They are self-contained and occupy the minimum of floor space.

Send at once for full details of Barrett Centrifugal Galvanizer

THE LEON J. BARRETT CO., WORCESTER, MASS.

Designers and Builders of Centrifugal Machinery



Atmospheric Pot Furnaces for Salt, Cyanide, Lead Hardening and Melting Aluminum and Zinc. Attains 1650° F

Rectangular Liquid Heat Treating Baths and Melting Furnaces.

BUZZER Gas Fired FURNACES

Reg U.S. Pat. Off.

Heat Quickly to High Temperatures, without Blower, Power or other Auxiliary Equipment . . . just connect to your Gas Supply.

All "BUZZER" Industrial Gas Furnaces are rugged in construction, efficient in design, economical in operation and fully insulated.

The New BUZZER Catalog gives full details and information on wide range of models and sizes available for Heat Treating purposes, Burners and other equipment. Send for it today.

CHARLES A. HONES, INC.

121 South Grand Avenue, Baldwin, L. I., N. Y.

Stuart's Thred Kut

AMERICA'S NO. 1 CUTTING OIL

PROVED ON THE TOUGHEST CUTTING JOBS . . .

"THRED-KUT" is tops where applications call for the "toughest" cutting oil. In diluted form it saves money on average and easy jobs. It is used in manufacturing armories, arsenals, munitions plants, aircraft plants and all other industries that demand the most modern cutting oil. A long list of leading machine tool builders recommend "Thred-Kut" — they want their machines to have every advantage.

For All Cutting Fluid Problems

D. A. STUART OIL CO.

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Warehouses in Principal Metal Working Centers

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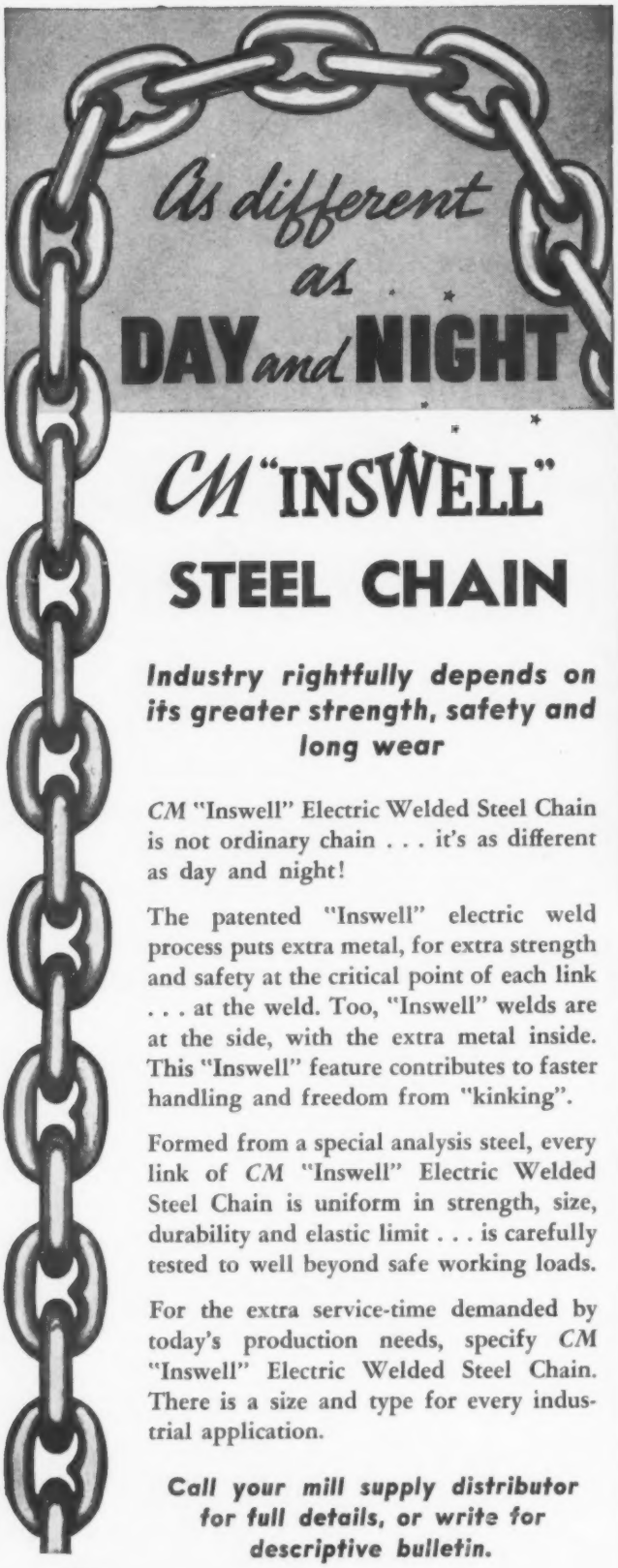

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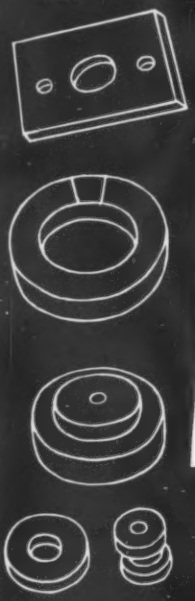

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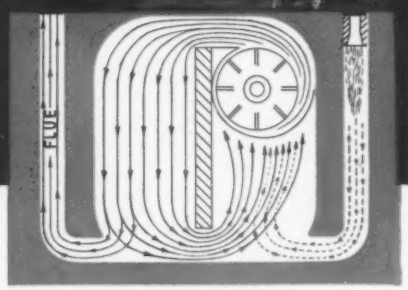

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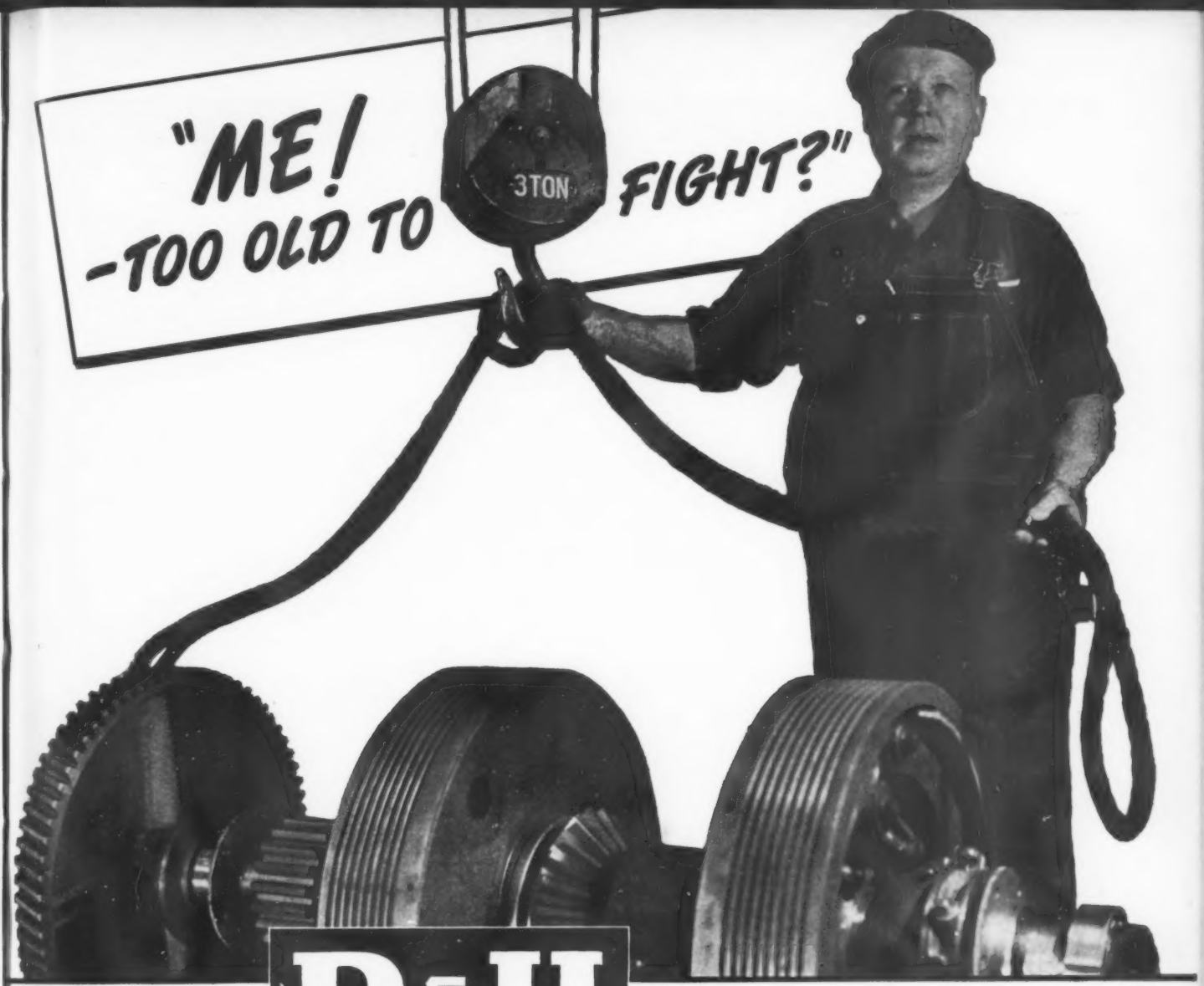

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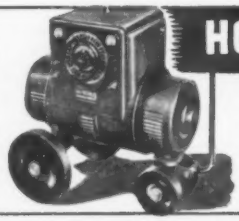

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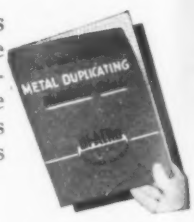

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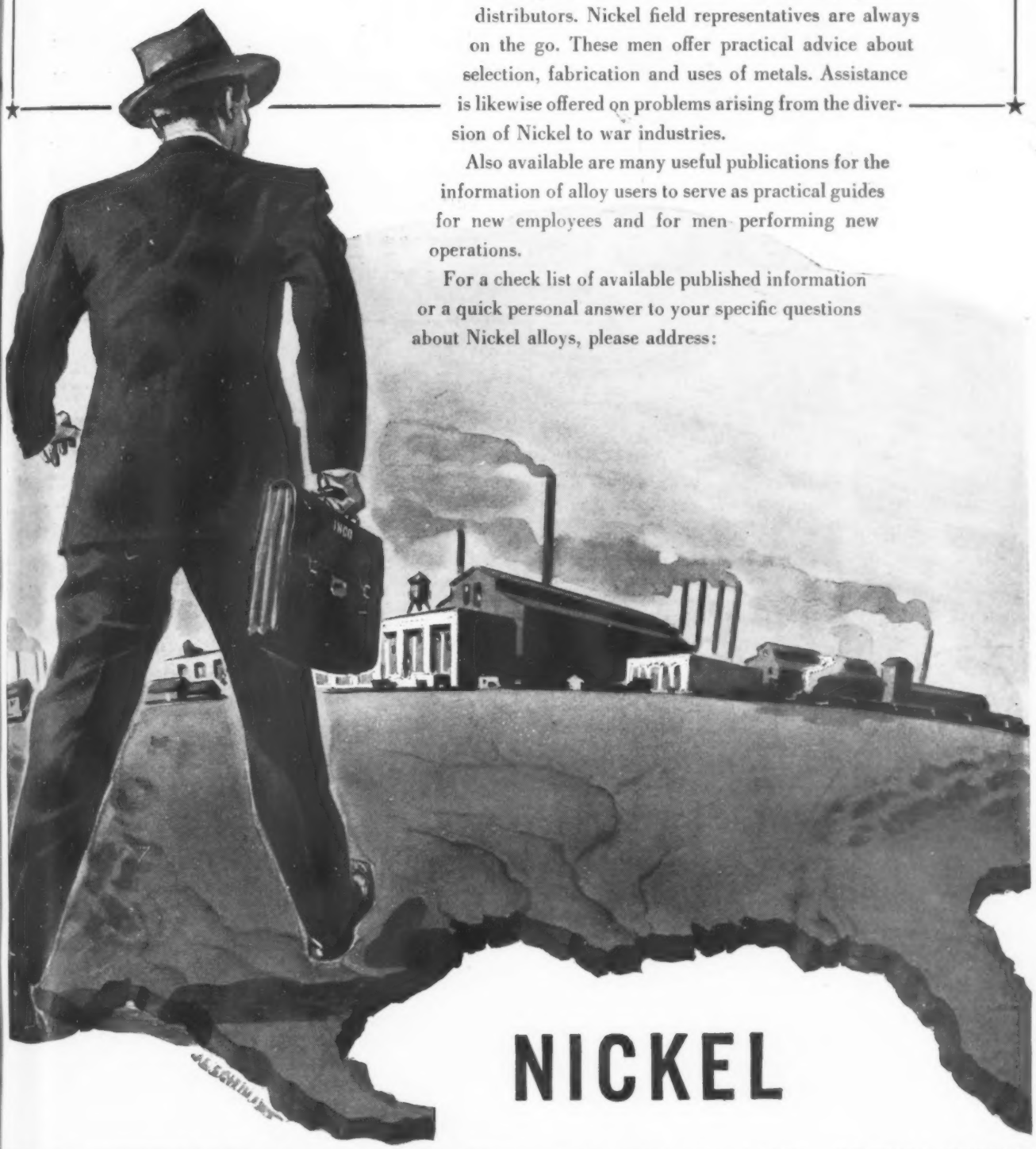
For a check list of available published information or a quick personal answer to your specific questions about Nickel alloys, please address:



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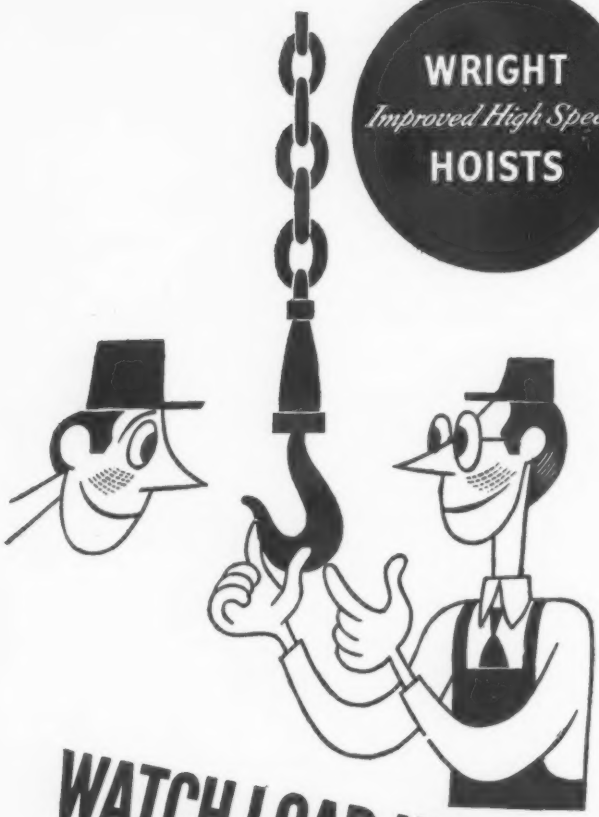
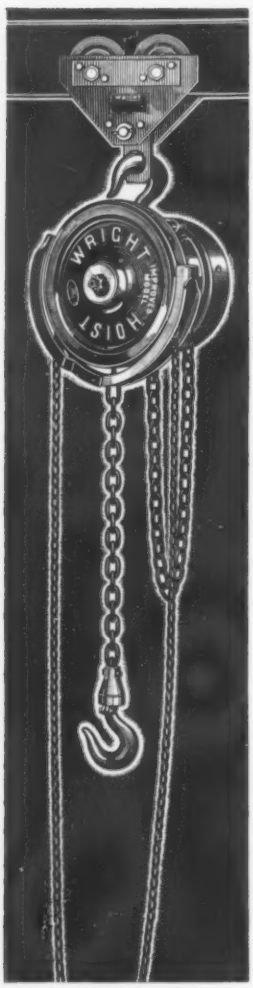


WATCH LOAD HOOK!



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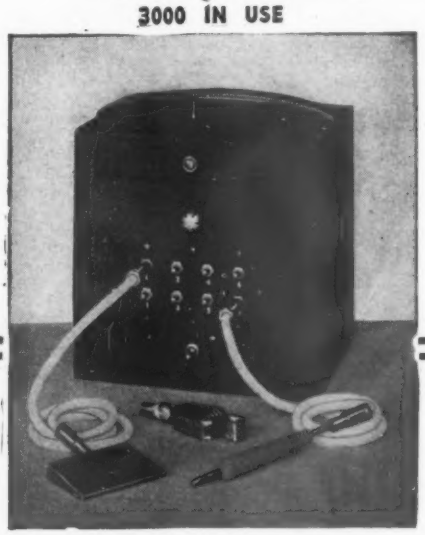

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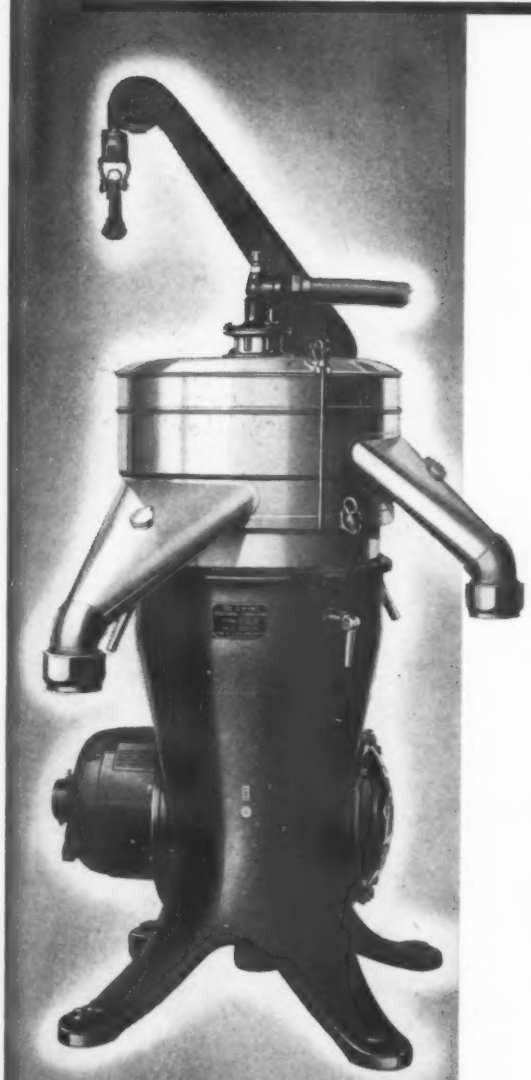

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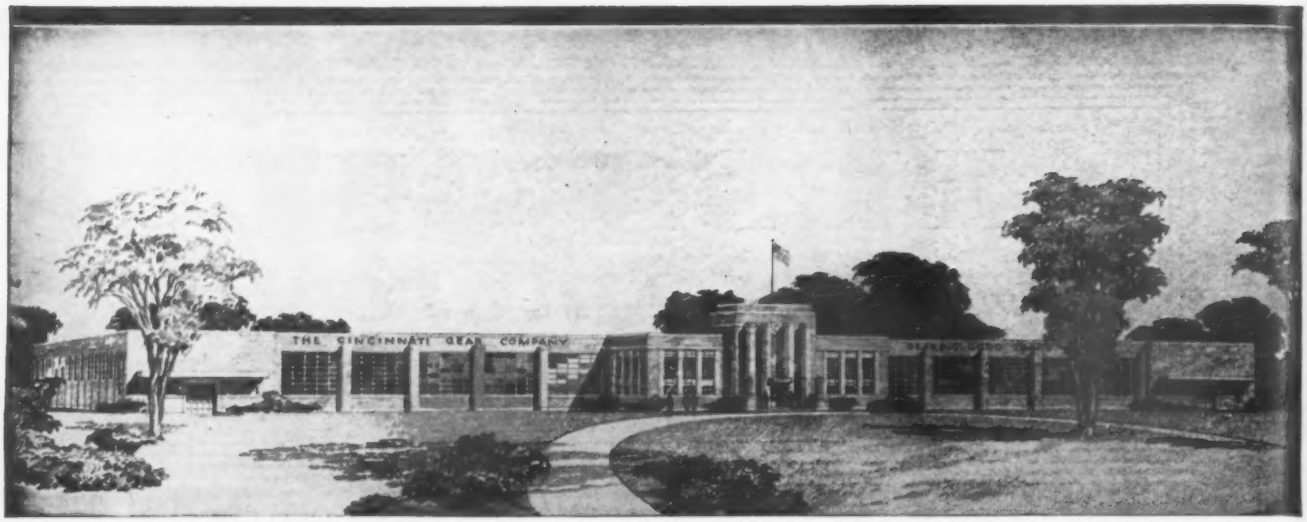

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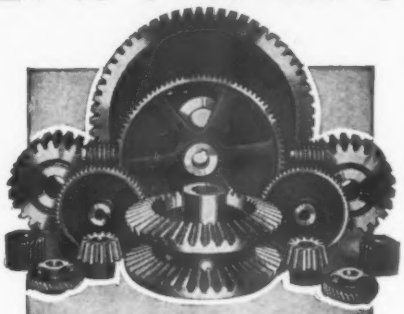

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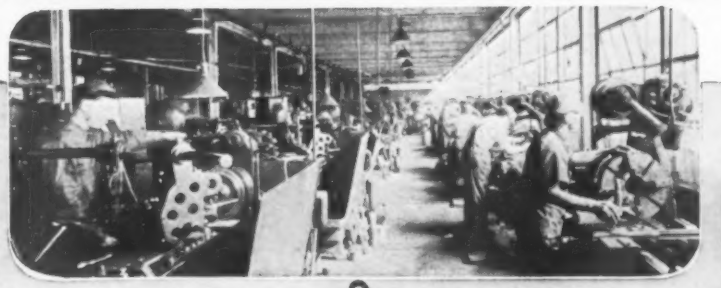

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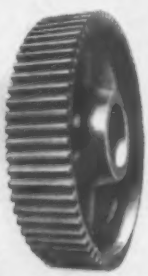

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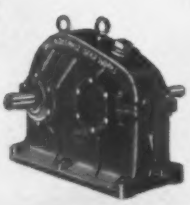

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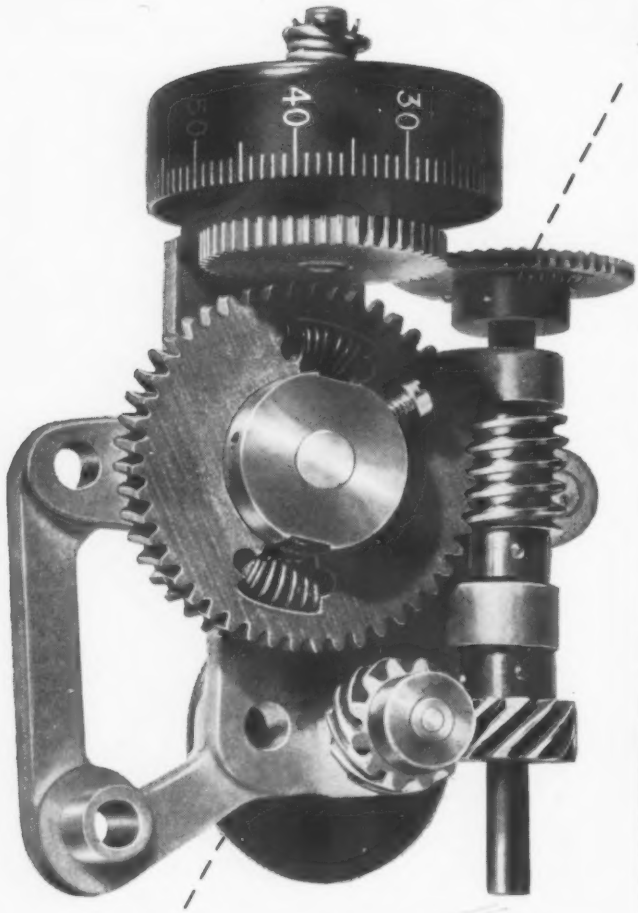

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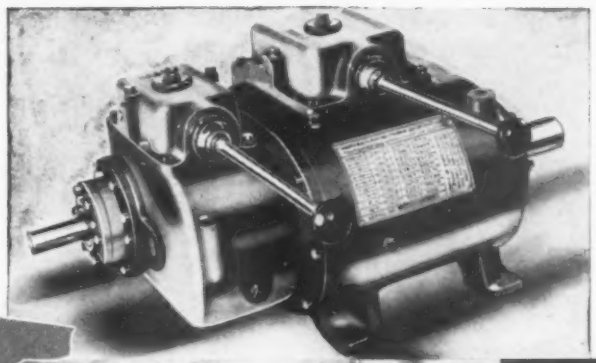

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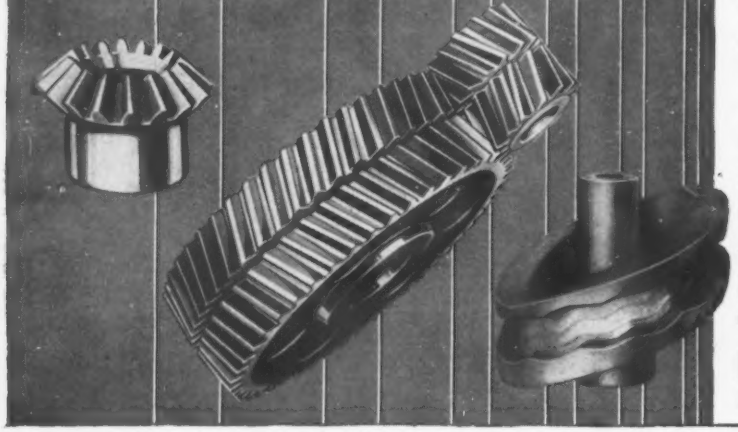


GET YOUR QUOTATION *from* "HARTFORD"

GEARS of every description cut to order
GEAR, CAM and THREAD grinding
AERONAUTICAL PARTS on contract basis

Send blue prints or samples for estimate. Accuracy of work guaranteed to your specifications.

THE HARTFORD SPECIAL MACHINERY COMPANY
HARTFORD CONNECTICUT

ARMY-NAVY "E"
PRODUCTION AWARD
★ ★ PRESENTED ★ ★
TO THE D.O. JAMES
MANUFACTURING CO.
February 27, 1943

IN APPRECIATION . . . It is very gratifying to publicly acknowledge our appreciation of receiving the Army-Navy "E" Production Award . . . this ensign and lapel insignia is a testimonial to the mutuality of the cooperation with . . . and the understanding of . . . our employees and management. This cooperative understanding has been productive of successful attainments that have resulted in a schedule maintenance and a quality to our products that make us proud in knowing that after 55 years of making all types of gears and gear reducers that we have again been given the opportunity of serving our country. Lastly . . . may we express extreme appreciation of the combined efforts of our employees, our suppliers, our executive control and management . . . and we solemnly pledge to do all possible to maintain and perpetuate this record of successful achievement during and after this emergency.

POWER SAVING PRODUCTS

Planetary Spur Gear, Medium and Heavy Duty Worm Gear, Generated Continuous-Tooth Herringbone Gear and Motorized Speed Reducers, in types to drive up, down, horizontally or at an angle, Cut Spur, Straight and Spiral Bevel, Mitre, Spiral, Worm, Internal, Helical and Herringbone Gears in all sizes and of all materials, Sprocket Wheels, Racks, Flexible and Universal Couplings.

D.O. James MANUFACTURING CO.

ESTABLISHED 1888

1140 W. MONROE STREET CHICAGO

Over 55 Years Making All Types of Gears and Gear Reducers

GEAR HARDENING *Hades*

Close-up of Rotary Hearth Atmosphere Controlled Hardening Furnace, Fairfield plant, Lafayette, Ind.

IN batteries of high temperature furnaces like that shown above, Fairfield heat treats thousands upon thousands of gears in the steady flow of wartime production. This setup of the finest type of equipment is typical of facilities throughout the Fairfield plant, facilities that have made many of the nation's leading manufacturers select this organization as their prime source for gears.

Most of Fairfield's production today is spoken for, to go into essential equipment and military machines, but your request for information as to what we can do to help you will be welcomed.

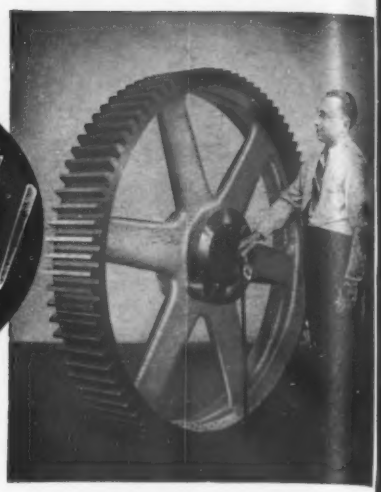
TYPICAL PRODUCTS FOR WHICH FAIRFIELD FURNISHES GEARS

COAL MINING MACHINERY
OIL FIELD MACHINERY
PUMPS — WINCHES
DIESEL ENGINES
HEAVY DUTY TRUCKS
MACHINE TOOLS
TRACTORS — STOKERS
CONSTRUCTION MACHINERY

FAIRFIELD *for FINE GEARS*

FAIRFIELD MANUFACTURING COMPANY
307 South Earl Avenue • Lafayette, Indiana

Whatta Gear!



. . . and WHAT A SERVICE BEHIND IT . . . . . .

This husky gear—produced by Stahl—typifies one class of work we are equipped to handle. We're equally well set up to produce small gears to any specifications and of any material in any quantity, because we are gear specialists.
All of which means that when you need gears you are invited to take advantage of Stahl's modern, efficient and complete production facilities. Prompt service and reasonable price can be depended on. Our quotation will interest you.

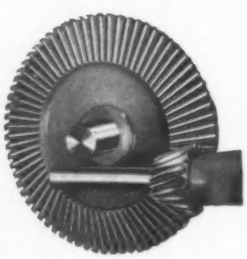
Send Us Your Specifications Now!

THE STAHL GEAR & MACHINE COMPANY
3901 Hamilton Ave. Cleveland, Ohio

GEAR CUTTING MACHINES

New Design
New Features
New Advantages

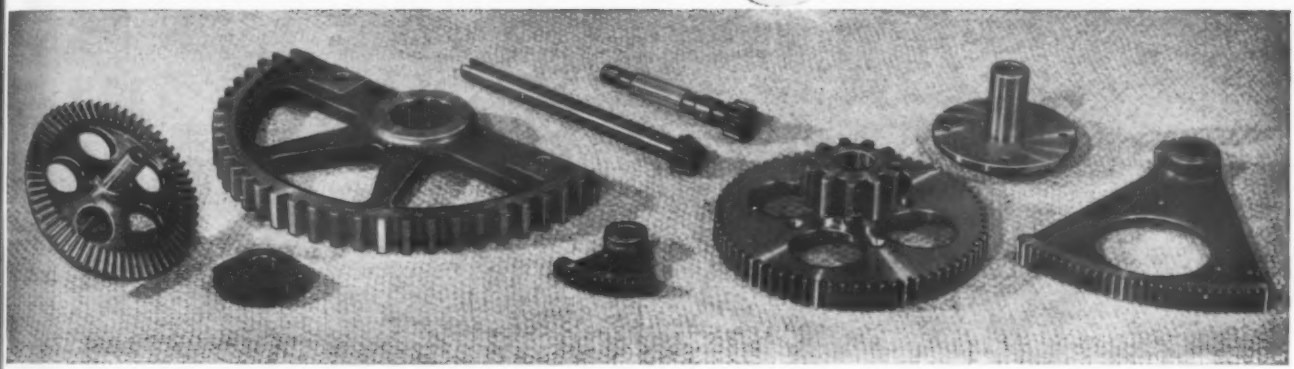
NEWARK GEAR CUTTING MACHINE CO.
69 Prospect Street, NEWARK, NEW JERSEY



BILGRAM QUALITY GEAR

ALL TYPES • ALL MATERIALS
BILGRAM GEAR & MACHINE WORKS
1217-35 Spring Garden, Philadelphia, Pa.

HELLDIVERS *use* OHIO *Precision* GEARS



The tough dependability of Ohio Precision Gears is proving itself at many points in the war production program. One striking example is the New Curtiss-Wright Navy Helldiver. Military restrictions prohibit a description of the application, but assemblies of the gears shown above play a vital part in this plane's fighting function.

In specifying Ohio Precision Gears for this particular job, Curtiss-Wright engineers were taking no chances. They were guided by the performance records of Ohio Gears in thousands of applications, both military and industrial. The reliability of these products had been proved.

Engineers at work on war construction or on post-war machine design will find Ohio Precision Gears the sound, economical answer to many of their power transmission problems.

THE OHIO GEAR CO.
1326 E. 179th Street · Cleveland, Ohio

★ ★ ★

*NEW YORK CITY, N. Y.
Patron Transmission Co.
154-156 Grand Street

NEW ENGLAND
George G. Pragst
332 Main St., Pawtucket, R. I.

*LOS ANGELES, CALIF.
J. W. Minder Chain & Gear Co.
927 Santa Fe Avenue

GRAND RAPIDS, MICH.
W. H. Slaughter
1924 Madison Ave., S. E.

*PITTSBURGH, PA.
Standard Machinists Supply Co.
South 2nd and McKean Street

DETROIT, MICH.
George P. Coulter
322 Curtiss Building

*MINNEAPOLIS, MINN.
Industrial Supply Co.
717 S. Eighth Street

BUFFALO, N. Y.
F. E. Allen, 2665 Main St.

*KANSAS CITY, MO.
Kansas City Rubber & Belting Co.
712 Delaware Street

*SAN FRANCISCO, CALIF.
Adam-Hill Co.
244-246 Ninth St.

LOUISVILLE, KY.
Alfred Halliday, 330 Starks Bldg.

*INDIANAPOLIS, IND.
A. R. Young
715 Fort Wayne Avenue

ST. LOUIS, MO.
St. Louis Tool Co.
2319 N. Ninth Street

Stocks carried.

★ ★ ★

OHIO GEARS

GRANT GEARS

"64 YEARS" MANUFACTURING GEARS

Despite the continued growth of our gear business we are still in position to give each customer the attention they have a right to expect.

We carry a complete stock of standard cut gears and can furnish special gears to your specifications.

GRANT GEAR WORKS
BOSTON, MASS.
ESTABLISHED 1877 BY GEO. B. GRANT

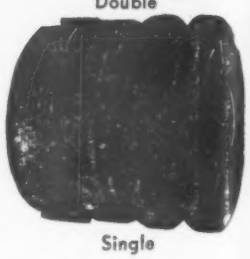
THE JOHNSON FRICTION CLUTCH

The NEW "MAXITORQ"

MULTIPLE DISC DESIGN IS SIMPLY ADJUSTED and EASILY CONTROLLED

The use of separator springs between the active discs in the JOHNSON "MAXITORQ" FLOATING PLATE CLUTCH assure quick disengaging and prevent excessive drag. Abrasion and heat common to many clutches of the multiple disc type are absent in the "MAXITORQ."

Double



This new development by Johnson is provided with a very simple manual adjustment so that smooth operation can be maintained under all power transmission requirements. Sensitive starting, safety and quietness are other advantageous operating features.

Single

Made in capacities from ½ HP to 5 HP at 100 R.P.M. in single, double and cut-off coupling types. WRITE FOR DIMENSION SHEETS covering all sizes and types.

Write for Multi-Disc clutch catalogue No. 41 or consult Sweet's or Thomas' Reg.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

Gear Specialties

SPURS • HELICALS • BEVELS
(Straight & Spiral)
WORM GEARING • THREAD GRINDING
(14 to 96 D. P.)

This range logically embraces the gear components of many critical control devices essential to the war effort and this organization is proud of its contributions of such material in the program.

With full *production capacity* scheduled far into the future, all new inquiries are now necessarily subordinated to these vitally important prior commitments. However, every *urgent* need will be given careful consideration.

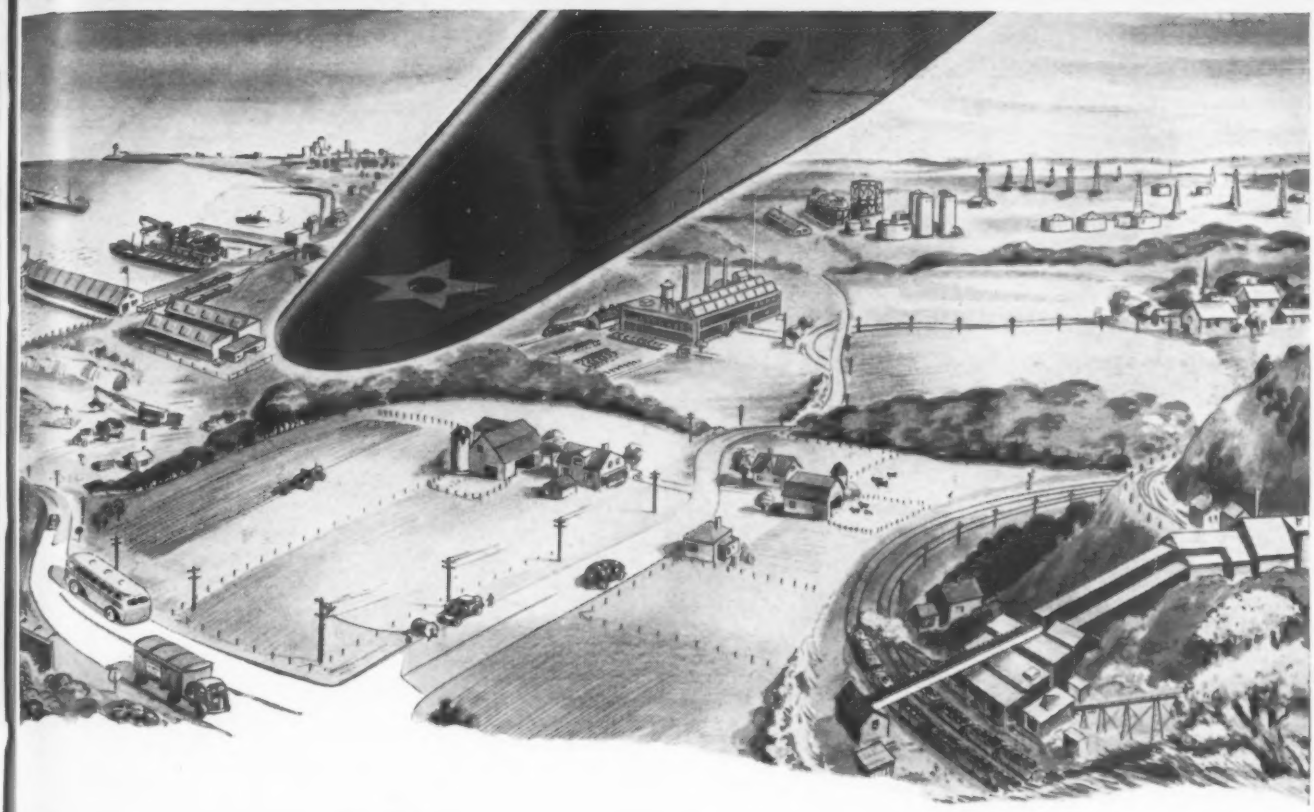
Gear Specialties
MANUFACTURERS
CHICAGO

2600 W. Medill Av. Ph. Hum. 3482

STAMINA is Vital

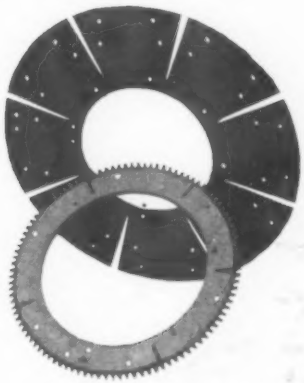
Rely on Abbott Bearing Balls to contribute to and safeguard the dependability expected of YOUR OWN products.
Keep 'em rolling!

ROLL ON ABBOTT Bearing BALLS
THE ABBOTT BALL COMPANY HARTFORD, CONN. U.S.A.



Velvetouch Dependability is Established on TWO FRONTS

VELVETOUCH Friction Materials are doing an outstanding job in many applications on America's combat planes, notably in brakes and supercharger clutches. On the home front, too, this miracle of powder metallurgy has proven its dependability in all fields where conditions are unusually severe . . . in oil well and marine equipment, on trucks and busses, in earth-moving and agricultural machinery. Especially on tough jobs in the metal-working industry . . . in radial drills, presses, lathes, forging machines, cranes . . . VELVETOUCH is setting new high standards for smooth, positive operation of clutches and brakes.



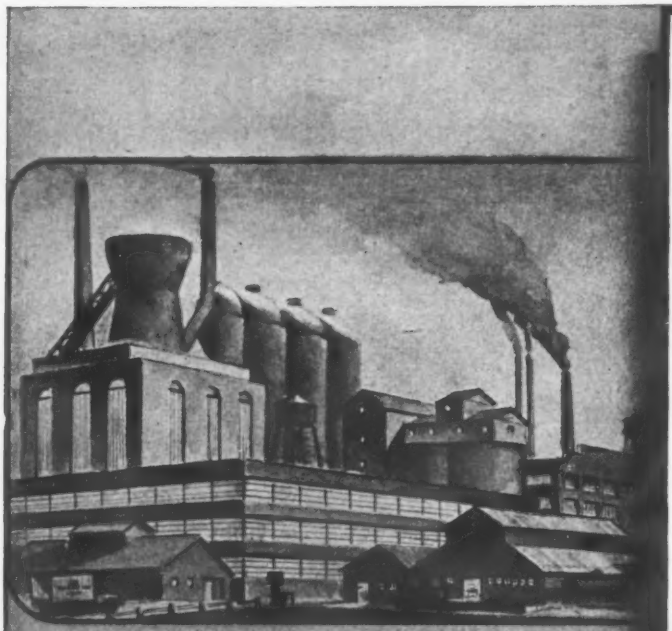
VELVETOUCH is an all-metal friction material — a combination of sintered powdered metals, compressed and welded to a solid metal backing. Can be supplied in a wide variety of constructions for all requirements in industrial machinery.

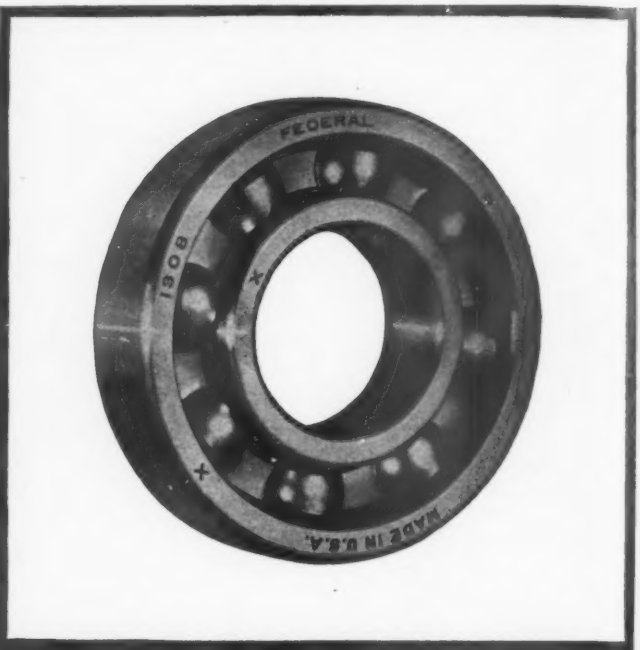
TRADE MARK REG U S PAT OFF.

THE S. K. WELLMAN CO. Velvetouch

1374 EAST 51ST STREET
CLEVELAND, OHIO, U.S.A.

PIONEERS IN PUTTING POWDER METALLURGY TO WORK FOR INDUSTRY





FEDERAL BEARINGS are now serving the armed forces of the United States in the air and on land and sea. These QUALITY bearings are used, also, for all industrial purposes.

FEDERAL BEARINGS

As the facilities and resources of the FEDERAL organization are devoted almost entirely to the war effort we are unable to supply many types of bearings formerly manufactured.

TRADE MARK

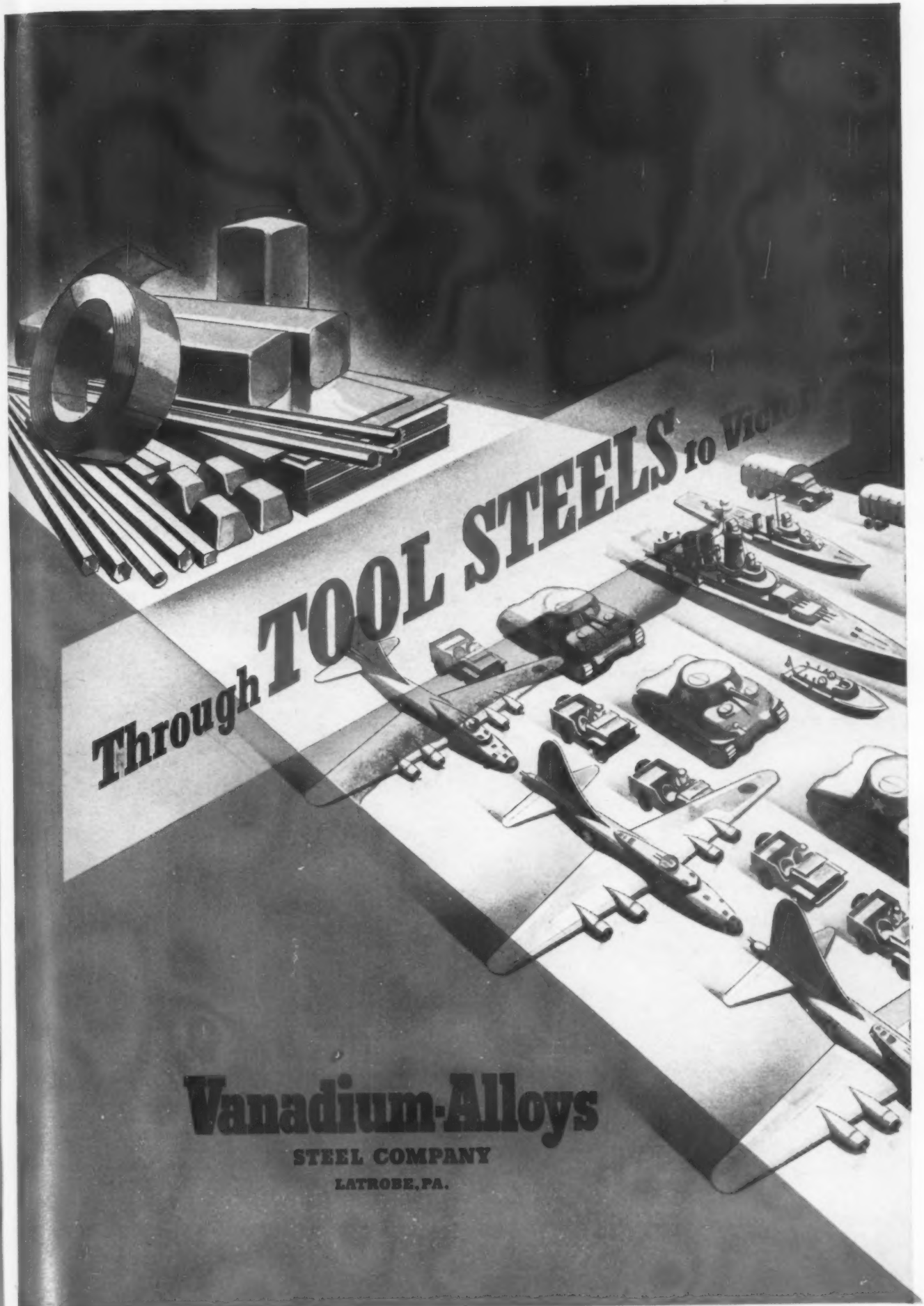
THE FEDERAL BEARINGS CO., INC.

Makers of Fine Ball Bearings

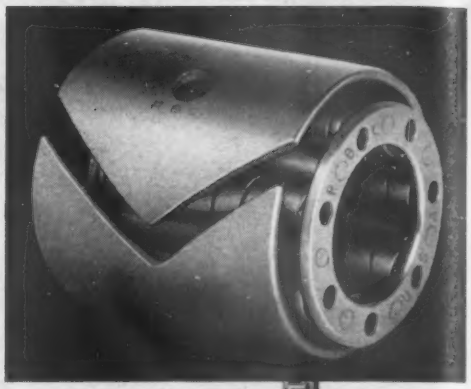
U. S. A.

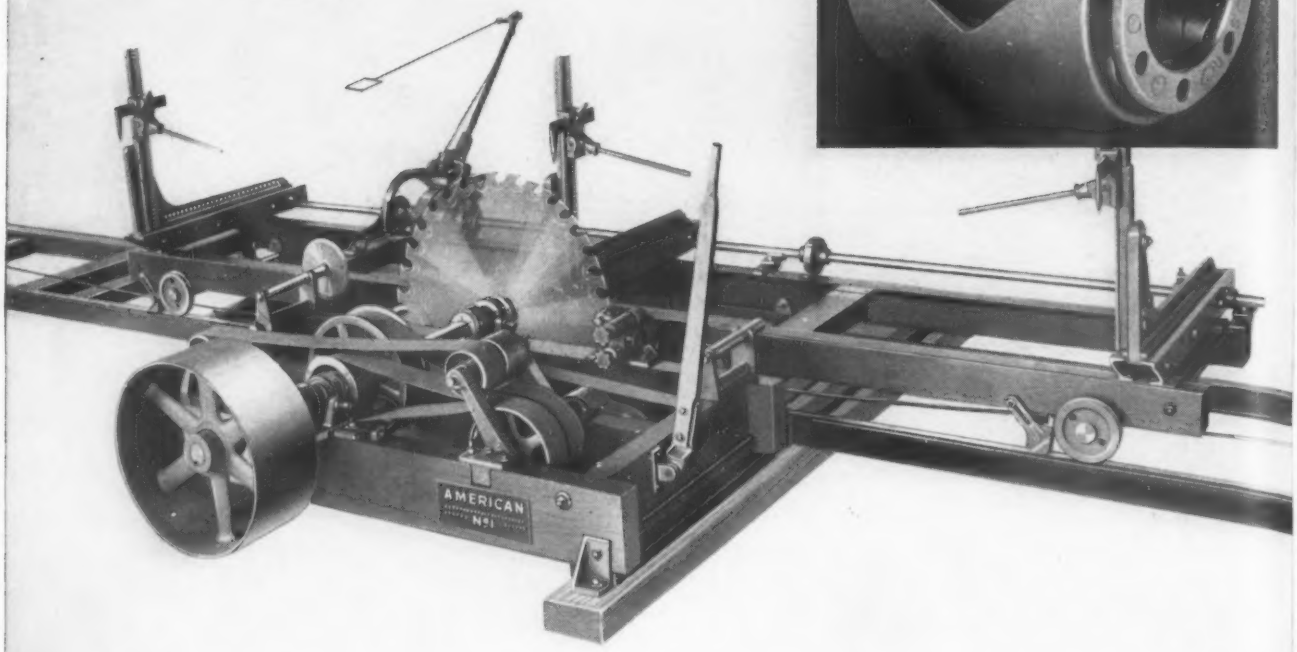
REPRESENTATIVES LOCATED AT

Detroit: 2640 Book Tower • Cleveland: 402 Swetland Building
Chicago: 902 S. Wabash Ave. • Los Angeles: 5410 Wilshire Blvd.


Through TOOL STEELS to Victory
Vanadium-Alloys
STEEL COMPANY
LATROBE, PA.

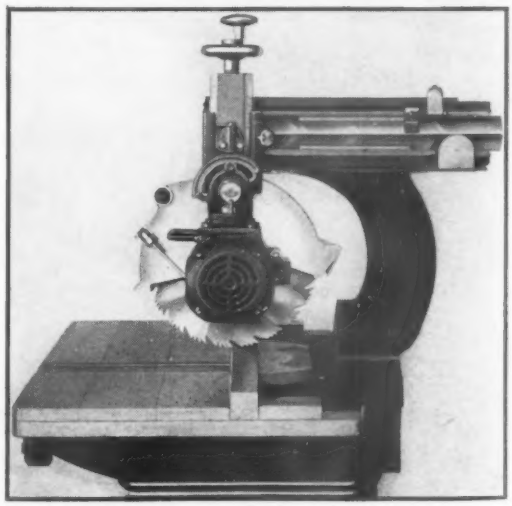
AMERICAN
SAW MILLS





RIDE ON
RBC
ROLLER BEARINGS

Millions and millions of feet of lumber are being cut on these saw mills for use in army camps, naval and air bases, shipyards, automobile and aviation plants and many other war industries entailing "round-the-clock" service for these RBC Standard Duty Roller Bearings. Here is high anti-friction quality at low cost providing for long, economical-trouble-free service.



MONARCH UniPoint Radial Saw

We quote American Saw Mill Machinery Co., "In spite of the unusual burden imposed upon these wood working machines and bearings by the national emergency and constantly stepped up requirements for all time records of production, RBC Roller Bearings have proven 100% efficient in both quality and performance.

ROLLER BEARING CO. of AMERICA
TRENTON . . . . NEW JERSEY

Century open protected squirrel cage motor. Now available from 2 to 15 horsepower.

15 horsepower, splash proof, squirrel cage, induction motor. For installations requiring protection from falling objects or plant wash-downs.

5 horsepower, totally enclosed, fan cooled, squirrel cage motor. For installations requiring protection from dirt, or explosive grain dust.

15 horsepower, explosion proof, squirrel cage, induction motor. For installations requiring protection from Class 1 Group D gases.

CENTURY Offers You CORRECT MOTOR PROTECTION For Every Type of Application

● Whatever the conditions under which the motor must operate, whether for indoor or outdoor installations, there is a Century Motor designed and engineered to provide proper motor protection against all types of surrounding atmospheres.

Century Open Protected General Purpose Motors are designed and engineered to minimize the possibility of dripping water or solid objects entering vital motor parts. With standard insulations these motors also resist the action of mild acids and alkalies, normal moisture, and abrasive dusts. Century special insulations are available for higher concentrations of acids, alkalies, or steam.

Century Splash Proof Motors are engineered for use in motor applications exposed to frequent wash-downs with a hose. They are storm-proof for outdoor installations exposed to rain or snow. Special insulations are available for unusual acid or alkali-laden atmospheres.

Century Totally Enclosed Fan Cooled Motors are intended for applications in machine shops or other places where they are exposed to abnormal amounts of coolant fog or spray combined with dusts and it is necessary to protect the motor against such atmospheres.

Century Explosion Proof Motors are protected against explosive dust-laden atmospheres or atmospheres containing many of the explosive gases. They carry Underwriters' label for Class II, Group G, and Class I, Group D hazards, respectively.

Your nearest Century Application and Service Engineer will gladly give you complete details. He's always at your service — call him in.

CENTURY ELECTRIC CO.
1806 Pine Street St. Louis, Missouri
Offices and Stock Points in Principal Cities

305

One of the Largest EXCLUSIVE Motor and Generator Manufacturers in the World.

WHEELS for *TOOL* and *CUTTER* and *SURFACING* jobs—any size, shape, grit, porosity or grade hardness! Whatever your requirements may be BAY STATE will serve you well. Send in your problems. We can help you.

BAY STATE

ABRASIVE PRODUCTS CO., WESTBORO, MASS. U.S.A.

IN AMERICA'S GREAT PRODUCTION PLANTS . . .

At Thompson Aircraft Products Company, batteries of Acme-Gridley Automatics are attaining a degree of accuracy never before possible in mass production.

Millions of Parts—QUICK!

Two and three times faster than they have ever been produced before, metal parts in great variety, machined with the utmost precision—those are the demands of a war production greater than any nation has ever met!

Acme-Gridley Automatics are turning out these parts, at speeds and feeds limited only by the capacity of tools to stand up under 24-hour schedules.

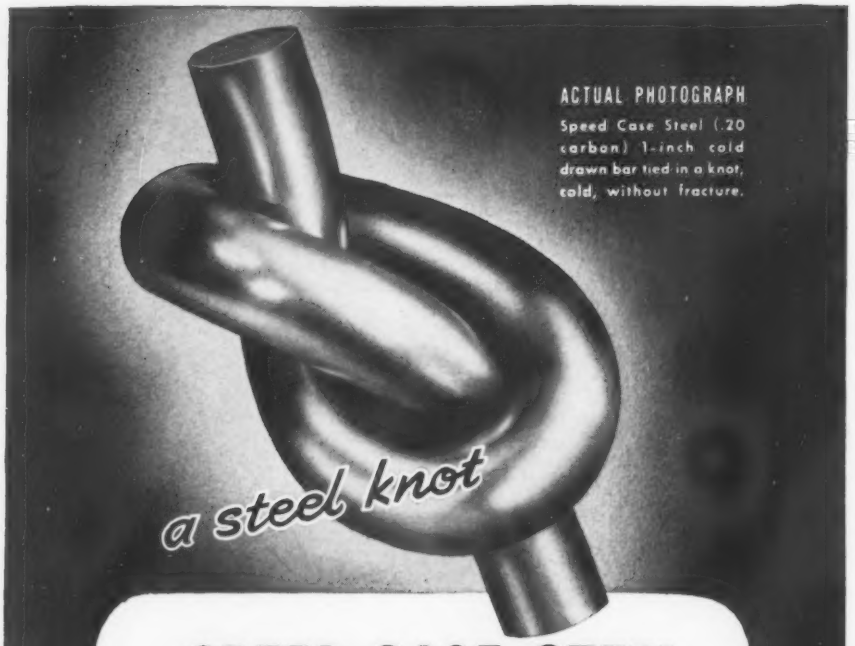
These 4, 6 and 8-spindle machines are quickly adapted to many classes of work, often as many as 20 operations on a single set-up. Large tooling area speeds setting up. Operation is convenient, output is uniform, costs are low.

And when industry goes to work on the growing backlog of peace-time needs, Acme-Gridleys will be ready to carry their full share of the load—at lower costs than ever before.

THE NATIONAL ACME CO.

170 EAST 131ST STREET • CLEVELAND, OHIO

ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES



SPEED CASE STEEL

A LOW CARBON OPEN HEARTH PRODUCT

ONE *Steel that gives you . . .*

1. High Speed Machining
2. Greatly Increased Tool Life
3. Smooth Finished Parts
4. High Physical Properties
5. Excellent Impact Resistance
6. Good Torsional Values
7. High Case Hardness
8. Great Core Toughness
9. Reduce Carburizing Time
10. Unusual Ductility
11. Minimum Distortion

SPEED CASE STEEL has *Physical Properties* equal to or higher than all other comparable steels . . . with great *DUCTILITY* . . . excellent *IMPACT* and *TORSIONAL* values.

WRITE US FOR DETAILS . . .
Our metallurgists are at your service.

BUY WAR BONDS

Licensor
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HAMMOND · INDIANAPOLIS · CHICAGO
PECKOVER'S LTD., Toronto, Canadian Distributor

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THE FITZSIMONS COMPANY
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MANUFACTURERS OF COLD FINISHED CARBON AND ALLOY STEEL BARS

Make Extra Money!

You can have extra money by conducting a business of your own in your spare time by taking orders for the

Big Seventh Edition
of the
AMERICAN MACHINISTS' HANDBOOK

Every man in your shop and other shops will find this practical Handbook of 1368 pages as useful as any tool in his kit.

Our spare time representatives in large and small shops have successfully sold thousands of copies of previous editions of the Handbook with profit to themselves.

HERE IS THE PLAN

This new seventh edition will be wanted by thousands of machinists, toolmakers, draftsmen, apprentices, in fact, anyone connected or dealing with machines. This book sells itself.

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AMERICAN MACHINISTS' HANDBOOK

Signed .....
Address .....
Company .....
Position .....A. 4-1-43

How will YOU Answer This Big Question?

So the question is: ***"What technical improvements in manufacturing methods, developed in war work elsewhere, could be adapted to our peacetime operations?"***

ALTER EGO: That's it—one of the questions being asked industrialists by the new Committee for Economic Development, urging PLANNING NOW for post-war business.

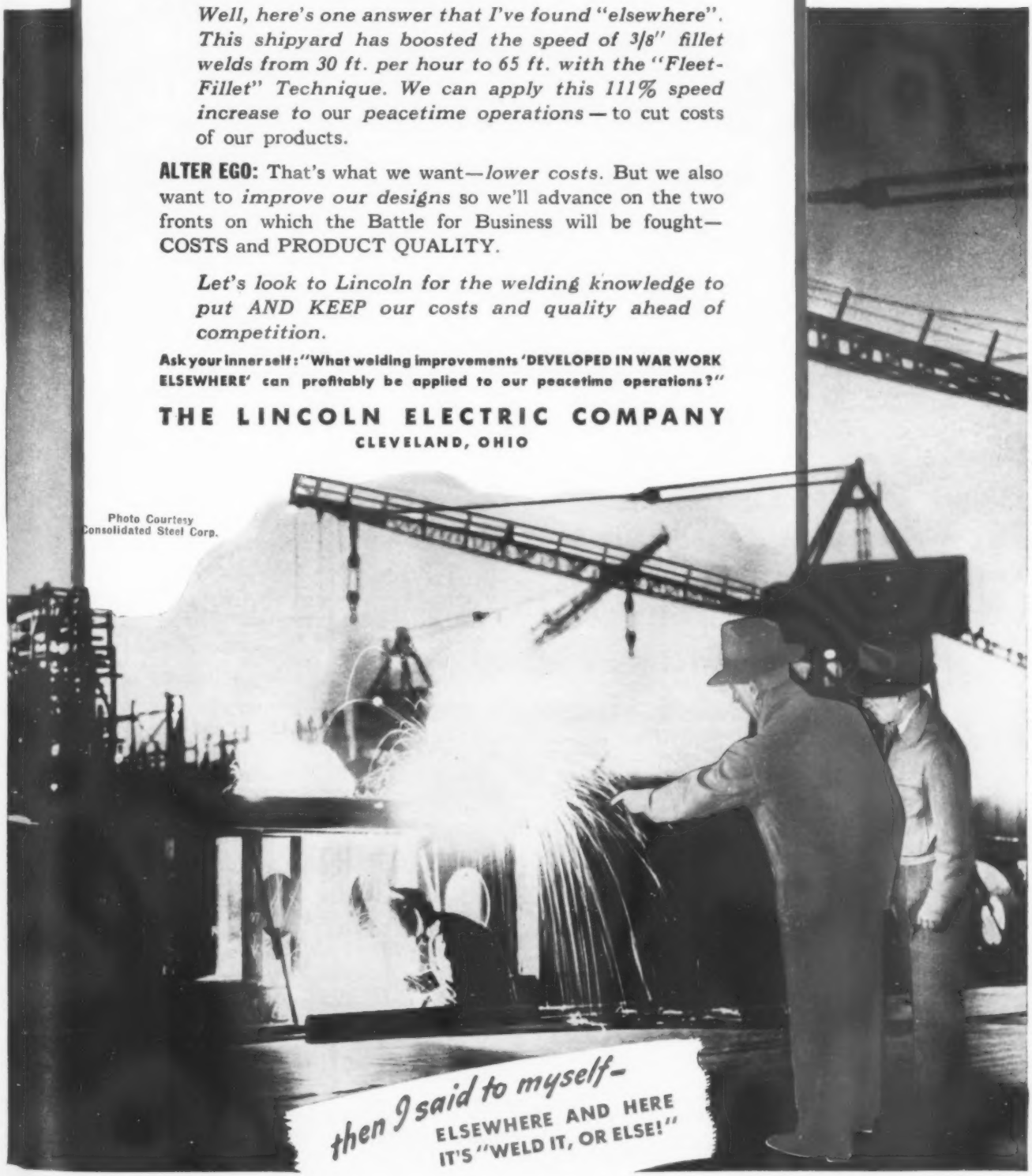
Well, here's one answer that I've found "elsewhere". This shipyard has boosted the speed of 3/8" fillet welds from 30 ft. per hour to 65 ft. with the "Fleet-Fillet" Technique. We can apply this 111% speed increase to our *peacetime operations* — to cut costs of our products.

ALTER EGO: That's what we want—*lower costs*. But we also want to *improve our designs* so we'll advance on the two fronts on which the Battle for Business will be fought—COSTS and PRODUCT QUALITY.

Let's look to Lincoln for the welding knowledge to put AND KEEP our costs and quality ahead of competition.

Ask your inner self: "What welding improvements 'DEVELOPED IN WAR WORK ELSEWHERE' can profitably be applied to our peacetime operations?"

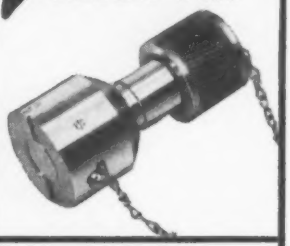
THE LINCOLN ELECTRIC COMPANY
CLEVELAND, OHIO



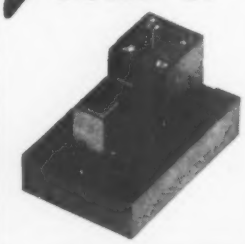
✔ RING

✔ SNAP

✔ FLUSH PIN



✔ BUILD UP



FAST DELIVERY

on these TURNER gauges

✔ RING ✔ FLUSH PIN
✔ SNAP ✔ BUILD UP

EACH TURNER GAUGE BEARS THEIR STAMP OF PRECISION

Again Turner scores a first on the production front—with this announcement on fast delivery of their precision built gauges. These Ring, Snap, Flush Pin and Build Up gauges all bear the Turner Stamp of Precision—your guarantee that they have been carefully inspected and approved according to Turner's high standard of gauge making.

Our new plant is the reason why we can still maintain the highest standards, while increasing our production. It houses the most modern equipment available, and the most experienced men to run it.

Let us fill that rush gauge order. Wire or write us today.

Wire or Write Your Order Today!

TURNER BROTHERS

TURNER GAUGE GRINDING COMPANY
2628 HILTON ROAD . . . . FERNDALE, MICH.

IF YOU WANT GAUGES IN A HURRY MAIL THIS TODAY

Turner Gauge Grinding Co.
Ferndale, Michigan

Gentlemen:

Please rush complete information on your ring, flush pin and snap gauges today!

Name _____ Title _____

Address _____

City _____ State _____

How to save time by doing more reading

That is a profitable paradox for you. More true today than perhaps ever before. For here in the pages of this publication are packed many helpful ideas . . . considerable useful information. Much of it, in fact, available from no other source.

And we most emphatically mean *both* the editorial and the advertising pages.

Just one new idea gleaned from these pages . . . a method for doing something better or faster or easier or at lower cost, may alone save you far more than a year's reading-hours invested in this and other worthwhile business papers.

Many people have found this a fact . . . not only once, but time and time again. That's significant . . . with time so precious today.

★

Good advertising speeds information from those who have it . . . to those who need it.

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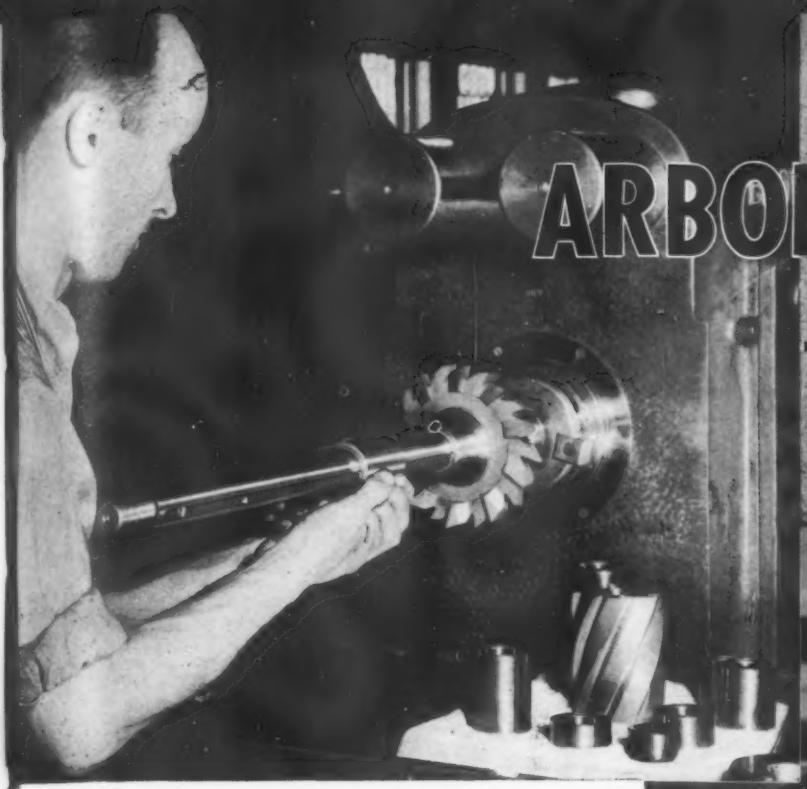
McGraw-Hill Publishing Company, Inc.

330 West 42nd Street New York



USE YOUR ARBORS PROPERLY

— to help speed production

It takes the best utilization of arbor equipment for cutters and machines to achieve maximum production. Do all in your power to keep these vital tools in service when replacement is so difficult.

Follow these simple precautions to keep them on the job —

BEFORE INSERTING any arbor in a machine, clean dirt or chips from the shank and from the machine taper hole — thereby assuring proper seating. This provides a true drive. It's a must to obtain accurate work and prevent excessive cutter wear.

CLEAN THE FACES of the sleeves and bushings to provide accurate running.

BE SURE arbor is well supported and of ample diameter.

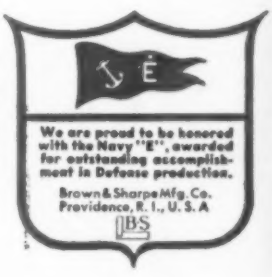
ALWAYS use a cutter driving key to prevent slippage and consequent damage to cutter, arbor, or work.

Except on very short arbors and those of Shell End Mill type, **DO NOT TIGHTEN** the arbor nut until the arbor is supported by a yoke. Such abuse results in distorted arbors.

BE CAREFUL not to run the work or some part of the machine into an arbor. Such action may spring it and cause damage to cutting tools.

WHEN NOT IN USE, arbors should be kept in racks where they may be found easily and not subject to injury from other heavy or sharp tools.

Your conservation of arbors will help you do more and better work and will result in increased cutter efficiency and longer machine life. It's **another** way to help in the united war effort.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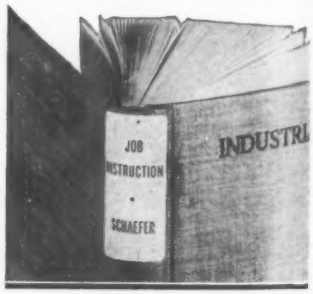

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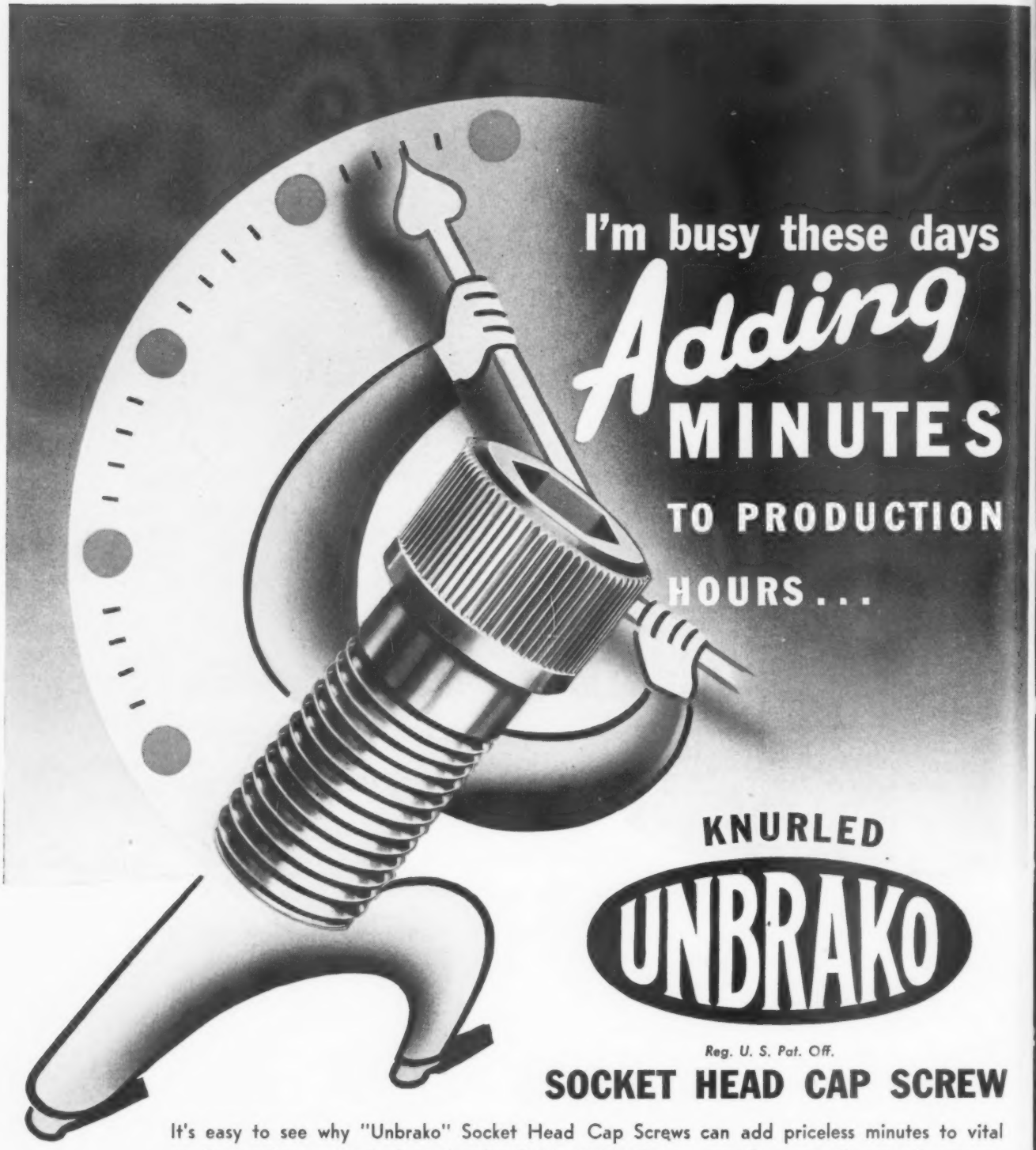

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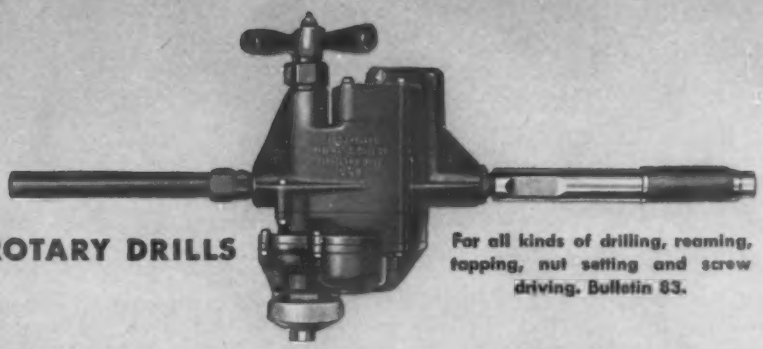

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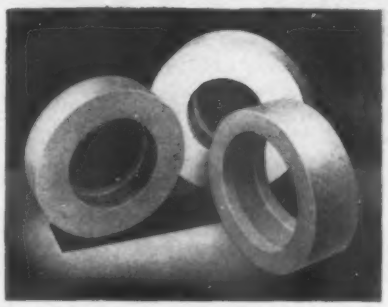

Back of our servicemen and our homes stand the factories, turning out materials of war faster and better than ever before. Upon our industrial efficiency depends final victory . . it will not be found wanting when war ends and more can be told of the tremendous amount of material which is being turned out in the foundries, machine shops and manufacturing plants throughout our country.

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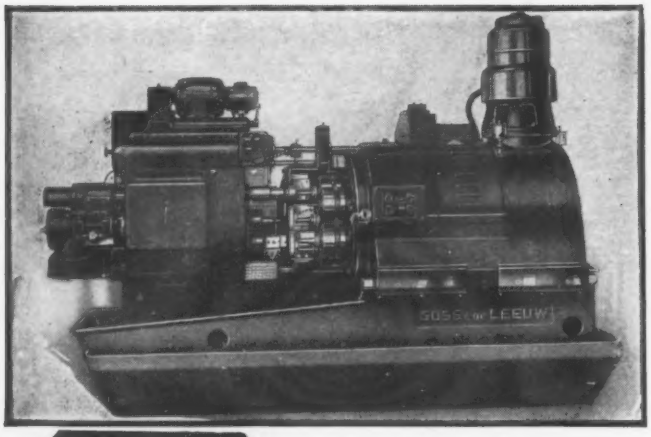

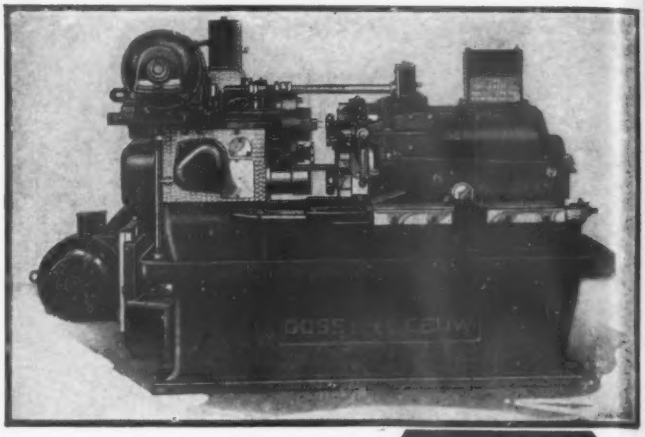

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6 Spindles
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Features include:

Lead Screw Threading on both types—Pre-loaded Anti Friction Spindle Bearings—Hardened Ways—Oversize Spindles—Gears of Chrome-nickel steel, carefully heat-treated.

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5 Chucking Positions

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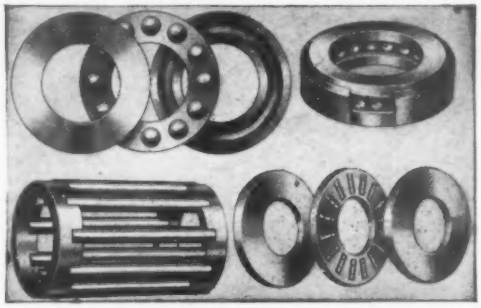

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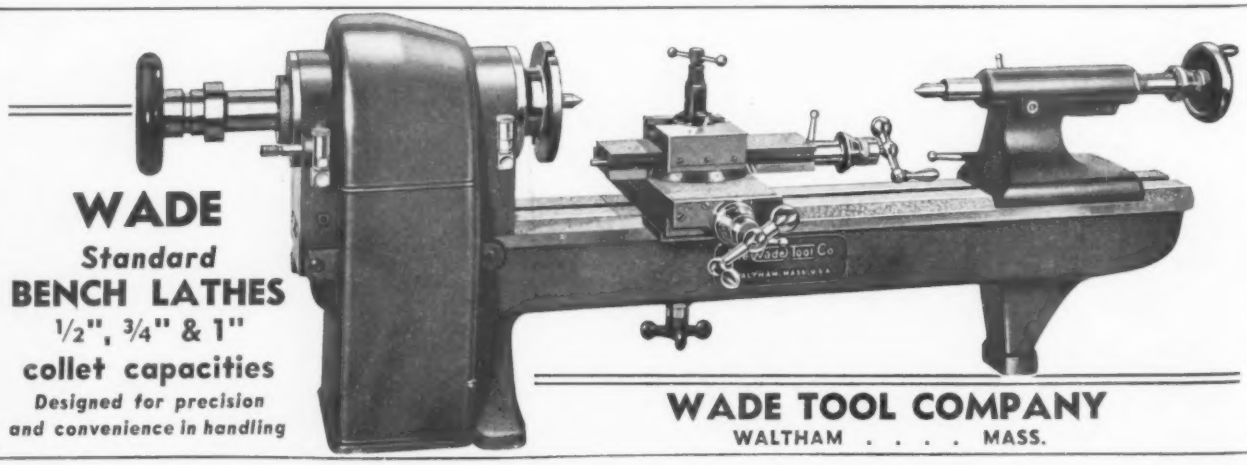

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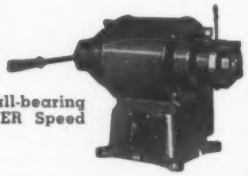

. . . of gears, pinions, pulleys, ball-bearing races and similar parts. Use SCHAUER Speed Lathes for increased production.

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Dependable power for pushing, pulling or lifting. Standard models, air or hydraulic, low or high pressure, for all requirements. Write for full details.

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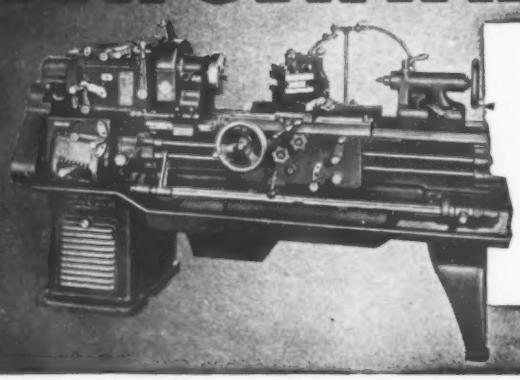

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Meet Every Demand of Wartime Metal-Working

The many Cincinnati Lathes now at work on war production are meeting the highest standards of precision, performing exacting jobs that require heavy cuts at high speeds, turning out uniform work under severe conditions of constant operation. Write for details of their rugged design, their versatility and accuracy. Built in 14" to 30" sizes, they are all real war producers!

THE CINCINNATI LATHES & TOOL CO.

Rogers Road, Oakley SPECIALISTS SINCE 1906 Cincinnati, Ohio

ARE YOU IN THIS SPOT?

ARE YOU TRYING to increase production in your plant?

ARE YOU TRYING to accomplish this with unskilled help?

You can do just that with TURCHAN FOLLOWER attachments. We speak from experience based on the records of other production executives. They have taken inexperienced help, put them to work on machines equipped with Turchan Follower attachments and not only did they increase production but also maintained accurate duplication of work.

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The Turchan Follower Attachment is a hydraulically operated and controlled unit for die-sinking and milling irregular contours and profiles on a standard machine tool without the use of highly trained operators. Sizing is automatic. All of this is accomplished at a fraction of the cost for specially designed equipment.

If you have a machine on which you think a Turchan Follower attachment could be used to advantage—write—wire —or phone us for information. Our engineers will be pleased to check your operation and tell you if and how this time and cost saving unit may be applied.

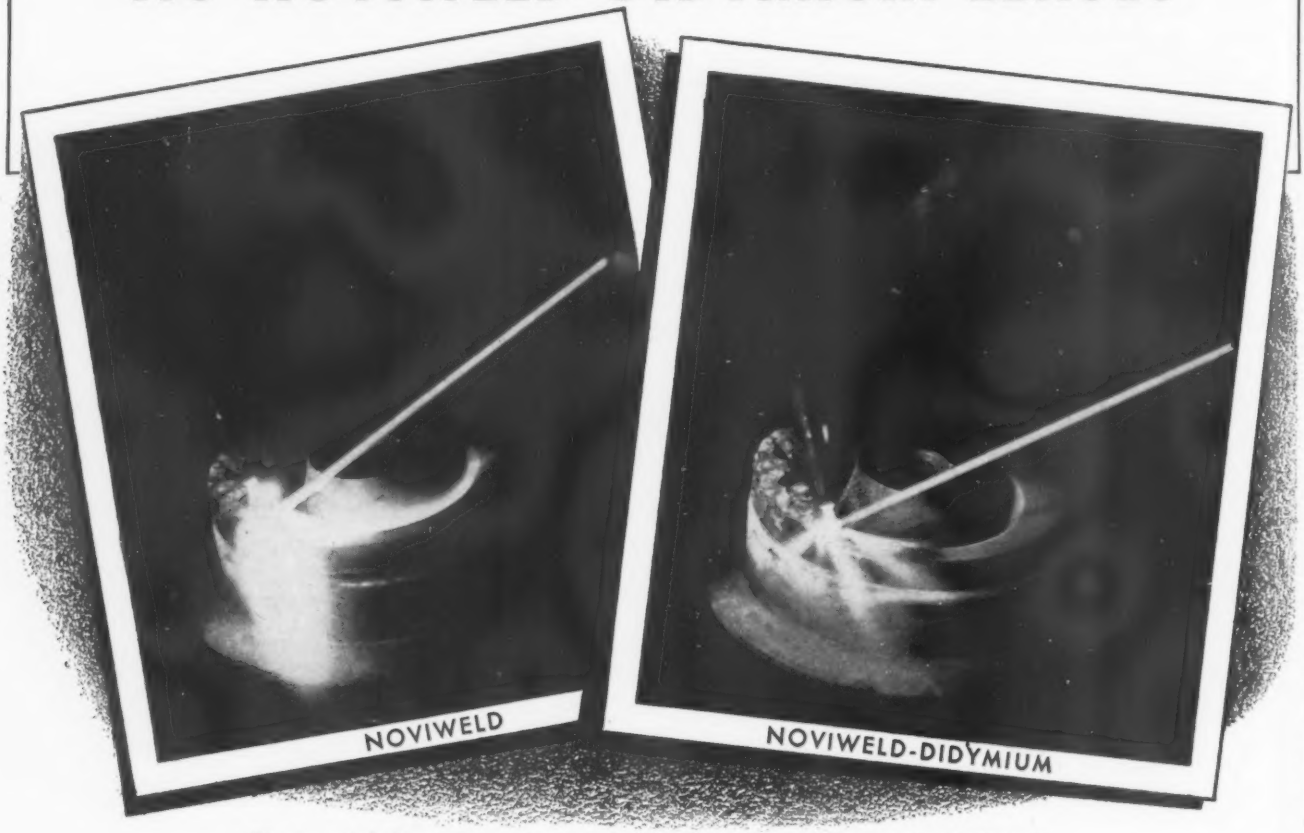
For urgent cases, we can make delivery in thirty days.

Originators of complete hydraulic duplicating attachments

TURCHAN FOLLOWER MACHINE CO.

8251 Livernois Ave., Detroit, Michigan

These unretouched Pictures show you why welders do better work with AO NOVIWELD-DIDYMIUM LENSES



The unretouched photograph, at right, instantly shows that welding goggles equipped with Noviweld-Didymium Lenses enables a flame-welder to look right through the cloudy yellow flame of burning sodium vapors and see the rod and molten area more clearly. This clearer vision greatly increases his efficiency, allows him to do more and better work, gives him greater protection and comfort.

... and NOVIWELD-DIDYMIUM LENSES offer you all these other advantages, too...

Noviweld-Didymium Lenses are considered by many who have tested them, to be the greatest welding glass *ever* developed! *That's* how important they are to your company . . . and to war production.

REMEMBER: AO Noviweld-Didymium absorbs Sodium flare and *also* protects welders' eyes against BOTH ultra-violet and infra-red radiation, meeting the Bureau of Standards Safety Code Specifications in both of the latter respects.

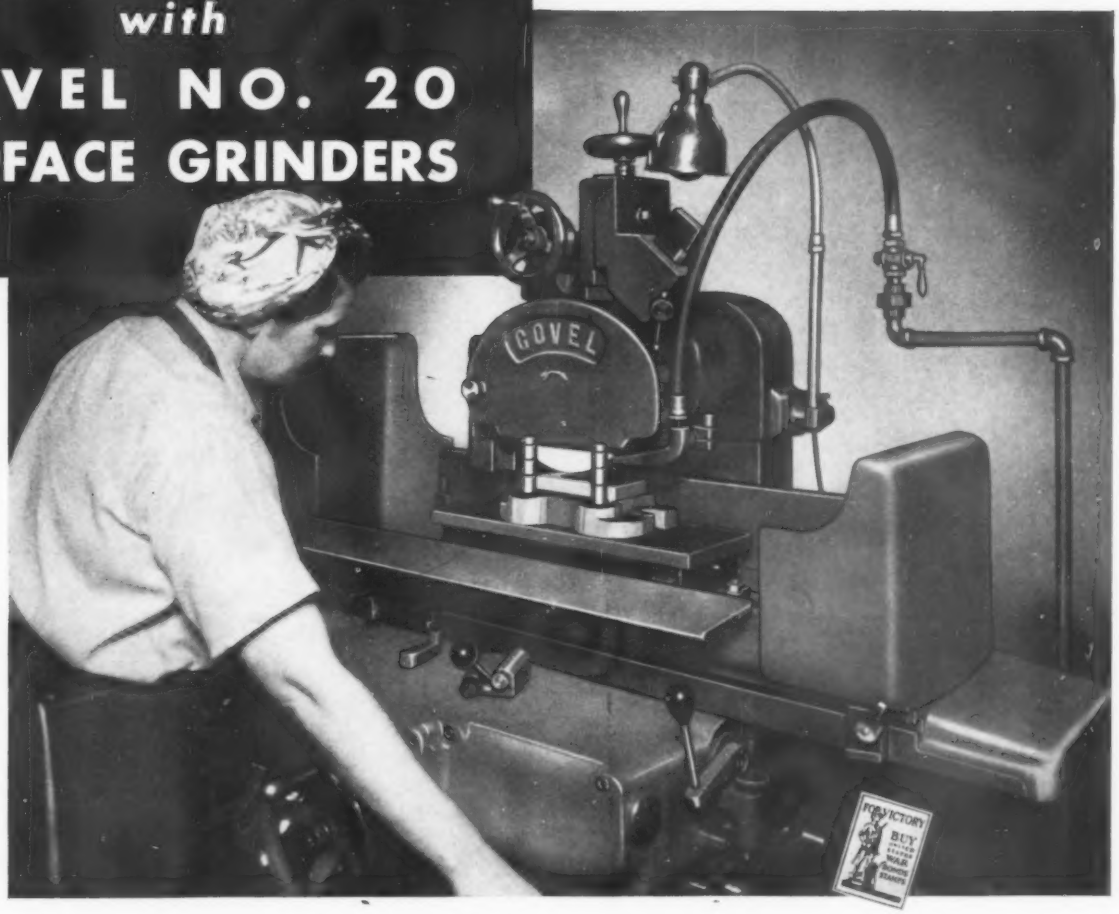
And, in addition, Noviweld-Didymium has the following *other* advantages: it preserves orange and red color values, enabling the operator to see red-hot bead and molten area in brilliant color, it is ground and polished to ophthalmic standards of quality, *and* present stocks indicate *immediate delivery* in shade numbers 4, 5 and 6 for welding goggles.

Behind Noviweld-Didymium are American Optical Scientists and the achievements of the AO Laboratory . . . the same laboratory that has contributed so many other outstanding developments to welding eye protection and *better* welding.

Don't wait . . . get in touch with your nearest AO Branch Office today for a convincing demonstration of how Noviweld-Didymium allows both skilled and inexperienced flame-welders to do better work.

American Optical
COMPANY
SOUTHBRIDGE, MASSACHUSETTS

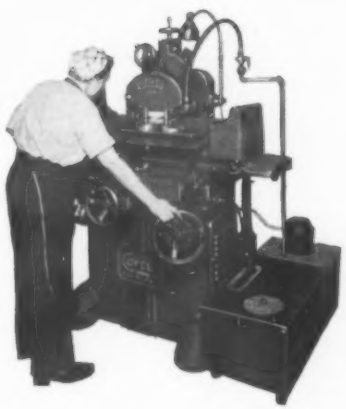
SPEED DIE MAKING with COVEL NO. 20 SURFACE GRINDERS



Shorten Employee Training Time With COVEL Equipment

Minutes saved in grinding add up to priceless *hours* saved in the vital job of die-making. In the operation shown here a Covel No. 20 is finishing a die surface to a close tolerance at high speed. Note that it was not necessary to remove the die's leader pins. Thus the time usually required to accurately replace and re-align the pins could be devoted to actual production . . . No. 20's flexibility, ease of operation and maintenance, and long life account for its popularity where speed *plus precision* is essential.

Covel's No. 20 (6" x 18") Hydraulic Feed Surface Grinder is described in Bulletin A73. Write, wire or phone for your copy today.



PROMPT DELIVERY TO WAR INDUSTRIES

Grinding Machinery Since 1874

COVEL INDUSTRIAL GRINDERS

COVEL MFG. CO., BENTON HARBOR, MICH.

SALVAGE YOUR DULL, WORN *rotary files*

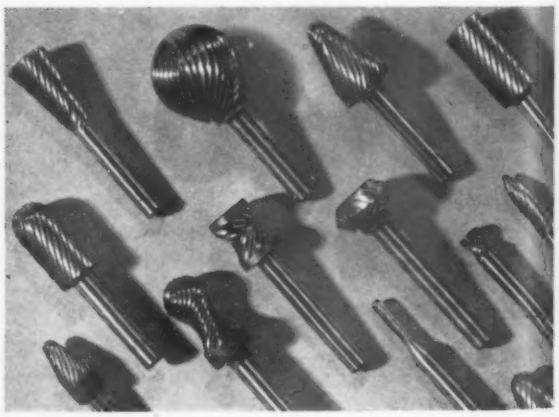
CONVERT THEM INTO SHARP MIDGET MILLING CUTTERS

There's good tool steel in those old, worn rotary files in your plant. In fact it's so good that we can convert dull rotary files into perfect Midget Milling Cutters. The cost to you is 65% off list of Severance new-tool price. SO NOW IS THE TIME TO HELP SALVAGE AMERICA'S PRECIOUS SUPPLY OF TOOL STEEL. Send us your dulled rotary files to have us regrind them into hard-biting, sharp-cutting Midget Milling Cutters.

•

NEW SEVERANCE MIDGET MILLING CUTTERS

Standard finishing tools for every type of metal and alloy, wood and plastic are being made today by Severance to help speed up your production. Inside and outside deburring cutters, chatterless countersinks, chatterless seating and facing cutters, electrode dressing cutters, reamers and special tools of every type are available. Write for complete information on all standard Severance Midget Milling Cutters and special tools.



Severance

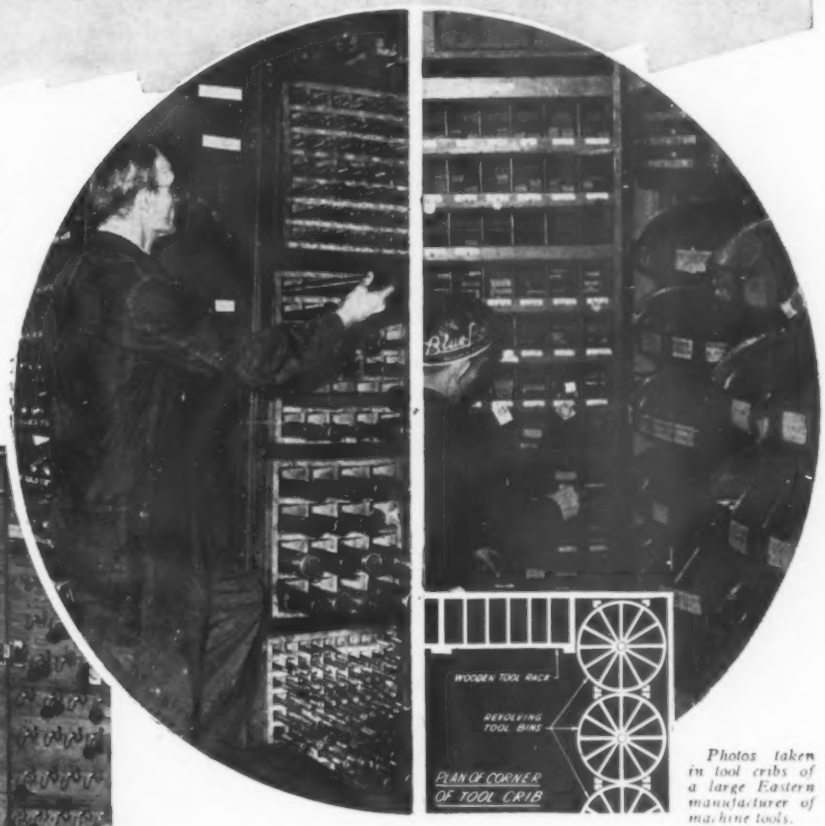
MIDGET MILLING CUTTERS • PRECISION REGRINDING
SEVERANCE TOOL INDUSTRIES, INC., SAGINAW, MICH.
PLANTS IN LONG ISLAND CITY, N.Y.; DETROIT, MICH.; FORT WAYNE, IND.; CHICAGO; AND LOS ANGELES

Tool Conservation BEGINS IN THE TOOL CRIB

Broaches (in circle, left) that formerly took much more space when spread lengthwise on flat shelves, now fit easily into these bins. Clear visibility and convenience to the delivery window mean less waiting time for these tools

•

Revolving bins (in circle, right) make the most of every square foot of space, give ready access to their contents. Sketch indicates how former "dead corner" was saved, and space made for wooden tool racks.



Photos taken in tool cribs of a large Eastern manufacturer of machine tools.

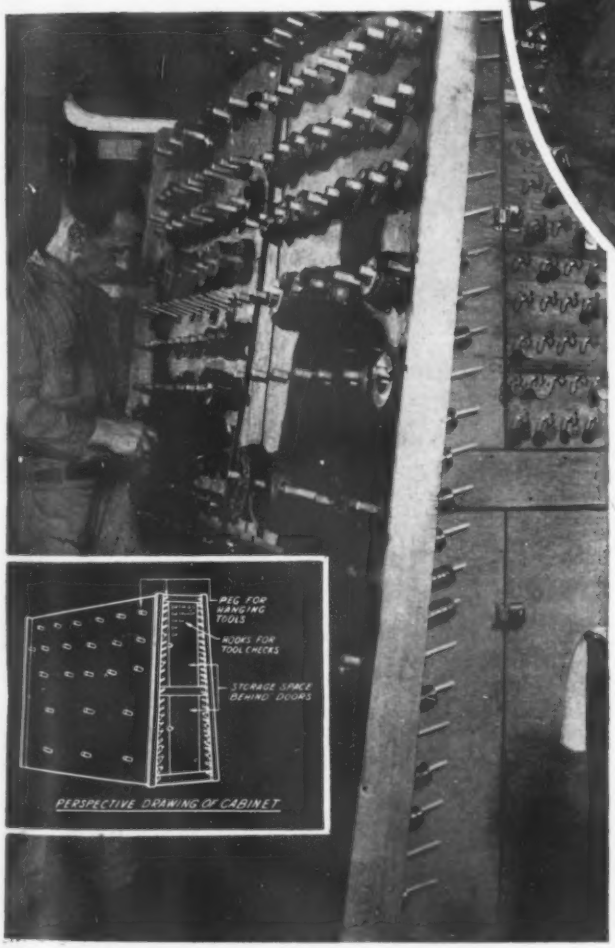


Photo courtesy of Arma Corporation, Brooklyn, N. Y.

Dead Space usually found in center of crib utilized by double deck "slanting-side" cabinet. Tools hang on sides, bulky items are stored inside. Doors are used for "in and out" tool checks.

AND Saves Space TOO!

Perhaps you've been thinking, "Yes, I'd like to plan my tool crib to take better care of my tools — but the plant can't give me more floor space."

Then you'll be interested in seeing how some plants improved their tool storage, and saved space too!

As these photographs show, space may be saved by:

1. Rearrangement of storage facilities.
2. Alteration or substitution of equipment.
3. Utilizing waste floor or wall space.

Yes, your tool crib can pay big rewards for a little careful thought.

GTD GREENFIELD

TAPS · · · DIES · · · GAGES · · · TWIST DRILLS · · · SCREW PLATES

ARMY E NAVY

GREENFIELD TAP AND DIE CORPORATION

GREENFIELD, MASSACHUSETTS

DETROIT PLANT: 5850 Second Blvd.
WAREHOUSES in New York, Chicago and Los Angeles.
In Canada:
GREENFIELD TAP AND DIE CORP. OF CANADA, LTD., GALT, ONT.

McCASKEY TOOL CRIB CONTROL

quickly and easily installed and operated by inexperienced crib attendants

*MORE PRODUCTION WITH **LESS TOOLS

* IMPERATIVE FOR MULTI-SHIFT OPERATION

McCaskey Tool Crib Control—by cutting the time required for drawing and returning tools—puts men and tools at *productive* work in a fraction of the time with checks and other systems. Multi-shift operation multiplies the demands on the tool crib. Tool service must be stepped-up to the increased pace of the plant. Tools must be available in good condition without the least delay. Lost time—and resulting lost production—of men and machines must be prevented.

Actual experience in numerous plants, large and small, is proving daily that McCaskey Control will increase production under the most severe conditions.

* * THREE SHIFT OPERATION WITH FEWER TOOLS

The difficulty of providing enough tools for two or three shifts is reduced by McCaskey. Tools not in actual use are returned promptly to tool cribs where they immediately are available for the next job. McCaskey records, totally visible at a glance, prevent the accumulation of tools at machines or in tool boxes —enable inexperienced crib operators to enforce economical use of available tools and fix responsibility for them.

Tool turnover or usage records, quickly secured, frequently reveal a surplus of important tools that are difficult to secure today and indicate inactive items that may be salvaged for essential operations. Tool breakage is reduced as much as 50% and loss and theft are practically eliminated. McCaskey assures "more production with less tools"!

McCaskey Tool Crib Control can be installed to meet your particular requirements quickly and easily without the least interruption of production. Write us *today* for complete reports of results secured in several nationally-known plants. McCaskey representatives are qualified to render valuable assistance. No service fee. No obligations.

NON-PRODUCTIVE TIME ELIMINATED The tool supervisor of a large brass company reports: "The adoption of McCaskey has eliminated the costly non-productive time frequently wasted by both men and machines, while missing tools were located . . . savings have repaid our investment many times over."

MAINTAINING SUFFICIENT STOCK FOR TOP REQUIREMENTS MORE evidence from a plant operating three shifts: "The (McCaskey) Control also provides a monthly turnover record for each tool that indicates the tools and the quantities of each to be reordered. The data is easily secured and it removes all guesswork from this important job. As a result, our *inventory has been substantially cut* but we know that we are carrying *sufficient stock for our top requirements.*"

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems, Ltd., Galt, Ontario, Canada The McCaskey Register Co., Watford, England

McCASKEY INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL

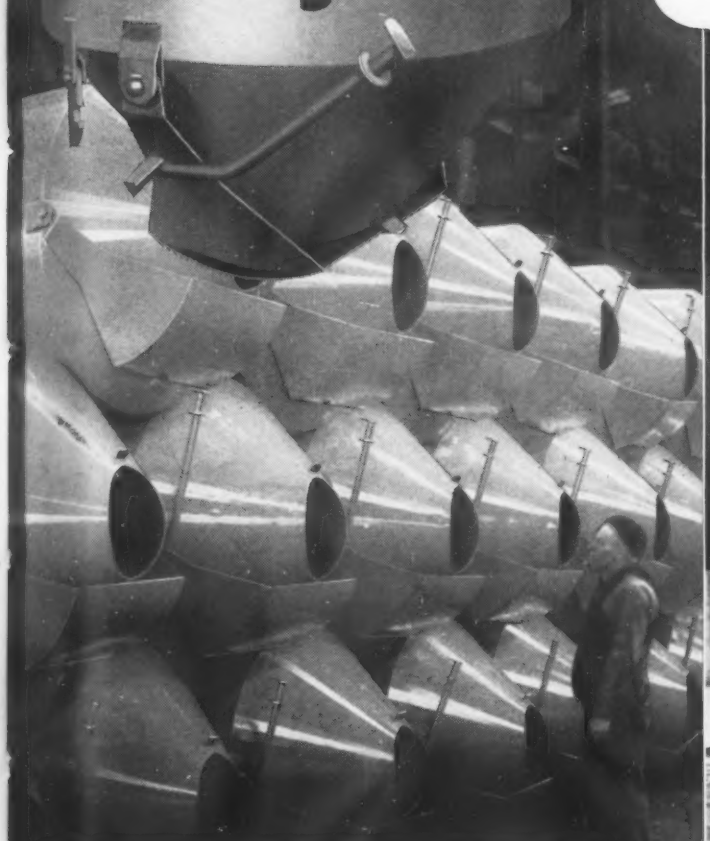
Fabricating BUCKETS on a Bending Press

All parts for these heavy buckets including cylindrical and conical sections, gate, gate arms, and various clips were formed on a Steelweld. Necessary holes were punched on it.

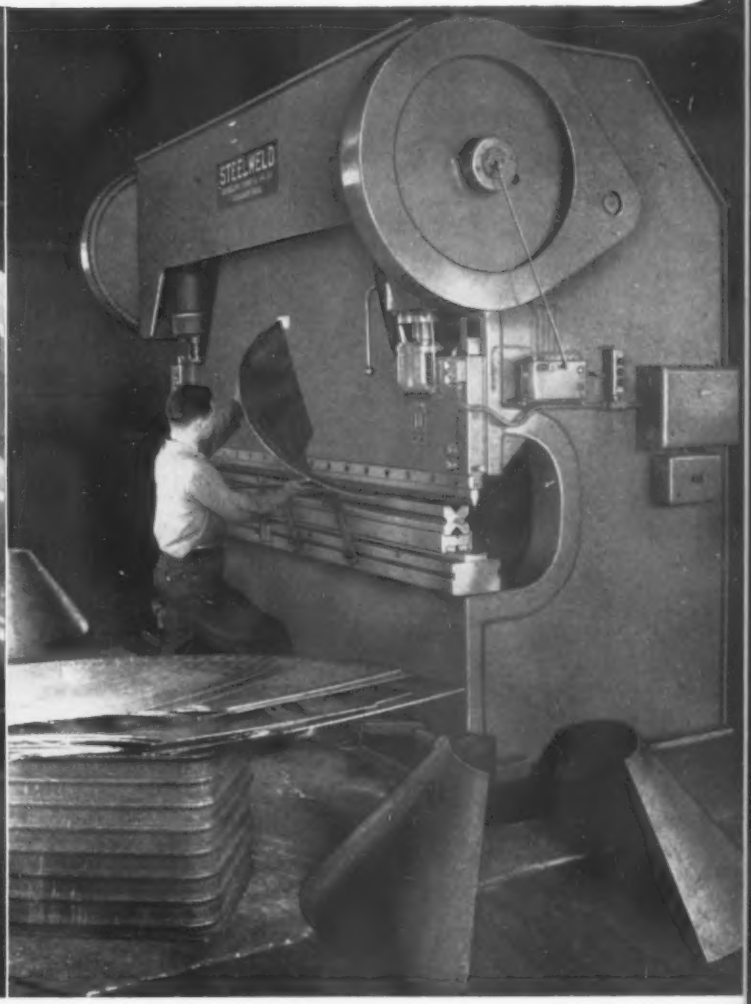
After the plate was cut, only the Steelweld Press illustrated and a welding machine were required to fabricate these buckets.

The many exclusive features not obtainable with any other press make Steelwelds extremely versatile. For instance, with the ram-tapering mechanism, conical sections are easily and quickly made with standard bending dies, the same dies as used for forming the cylinder and straight bending work.

Hundreds of varied jobs can be performed with simple dies on a Steelweld.



These buckets are 48" diameter by 70" high and are made of $\frac{3}{16}$" plate. Steelweld Presses are available for metal of all thicknesses up to one inch.



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CATALOG No. 2002 gives complete construction and engineering details. Mail request for free copy.

STEELWELD MACHINERY DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
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STELLITE 98M2 METAL-CUTTING TOOLS

For Machining Steel . . . Available for Immediate Deliveries . . .

Stellite 98M2 tools are made of a cobalt-chromium-tungsten alloy especially designed to increase the speed of machining steel. Developed by Haynes Stellite Company and Union Carbide and Carbon Research Laboratories, Inc., Units of Union Carbide and Carbon Corporation, this new alloy represents another achievement in the production of non-ferrous alloy cutting tools.

Tested on War Production—Stellite 98M2 tools have been thoroughly tested in the machining of many types of steel parts needed in the war program and are now being used for a wide variety of operations on such parts. Specific operations for which Stellite 98M2 alloy tools have proved especially suitable include turning, facing, boring, grooving, and forming of all types of steel.

High Rates of Metal Removal—These tools have proved that they will machine steel at even higher cutting speeds than Stellite Star J-Metal tools or Stellite "2400" tools, and with longer life between grinds. With the new tools, heavy roughing cuts can be taken with coarse feeds—to get high rates of metal removal—yet tool life is long and economical, for this new alloy has an *unusually favorable balance of red hardness, edge strength, and toughness.*

Available Forms—Stellite 98M2 tools are furnished as standard square and rectangular tool bits and welded-tip tools. Many sizes and types are available for immediate delivery. In addition, Haynes Stellite Company is prepared to furnish special tools made of this alloy, cast and ground to customers' specifications.

Send for this new descriptive price list. It will help you select the sizes and styles of Stellite 98M2 Metal Cutting Tools you require.

STELLITE
Reg U S Pat Off

HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

New York, N. Y. UCC Kokomo, Indiana

Chicago—Cleveland—Detroit—Houston—Los Angeles—San Francisco—Tulsa

• HIGH-PRODUCTION METAL-CUTTING TOOLS •

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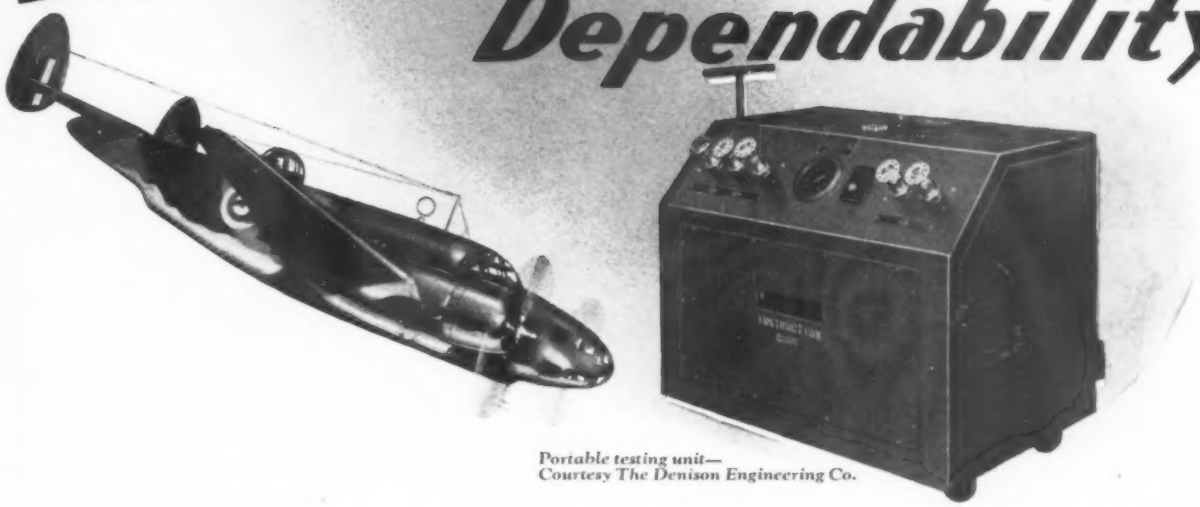
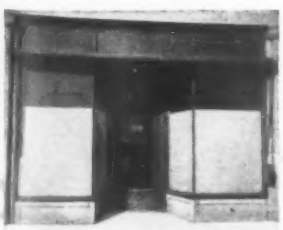
GRAFCO

HYDRAULIC TUBE COUPLINGS *for Dependability*



Portable testing unit—
Courtesy The Denison Engineering Co.

In America's ships, planes, and tanks . . . in American industry . . . Grafco Hydraulic Tube Couplings are serving dependably.



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Engineers and Manufacturers of

GRAFCO HYDRAULIC EQUIPMENT

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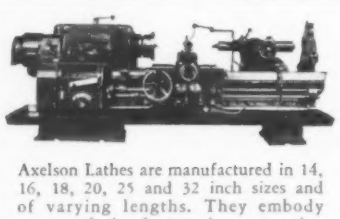
Known wherever metal is turned

In 1917 Axelson started to make heavy duty engine lathes. Acceptance for these lathes has increased steadily with the passing years. Today there is scarcely a manufacturing plant of importance in the United States that does not have in some department lathes bearing the Axelson trademark. Overseas, too, Axelson Lathes have won recognition and made friends with the metal working industry throughout the United Nations. For the duration of the war Axelson's prime objective will be to supply as far as possible the demands of those metal-working plants engaged in wartime production.

Axelson resources are pledged to Axis defeat. Axelson employees are pledged to carry on in their war effort the traditions of superior workmanship and quality established by the Company over fifty years ago.

Today the best in design, materials and workmanship have been combined by Axelson in producing a lathe unexcelled in operating performance. Axelson Lathes afford a wide range of operating speeds and feeds necessary for fast production. Those firms fortunate enough to secure Axelson Lathes now will find them operating year after year in their post-war industrial production at maximum efficiency with minimum power consumption. Before you buy any lathe now or in the future, investigate an Axelson!



Axelson Lathes are manufactured in 14, 16, 18, 20, 25 and 32 inch sizes and of varying lengths. They embody many exclusive features in construction and operation. Before you buy any lathe investigate Axelson.

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6160 South Boyle Ave., Los Angeles, Calif.
(P. O. Box 98, Vernon Station)

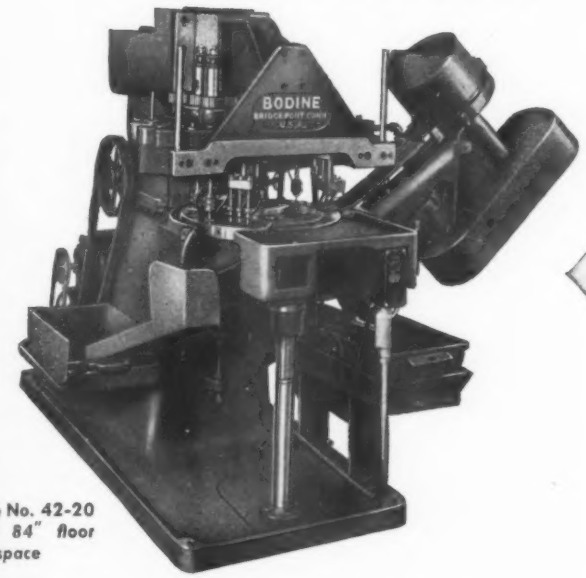
50 Church Street, New York City
3844 Walsh Street, St. Louis, Missouri

AXELSON LATHES

THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY — ARMY NAVY

DEPENDABLE FOR OVER A QUARTER CENTURY

makes PAST speeds look *old-fashioned*



Bodine No. 42-20
78" x 84" floor space

Here are sound reasons why Bodine machines are making *millions* of ordnance components . . . and why they are so outstandingly valuable for countless other small parts.

1. Multiple Spindles with variable speeds operate vertically, horizontally, inverted.
2. Automatic horizontal indexing dial carries work to successive processing stations.
3. Several operations on each of many parts during one cycle of the dial.
4. Easy feeding, automatic ejection.
5. High speed, extreme accuracy.
6. Automatic electrical devices protect tools, machines, operator. Minimize down time.

DRILLING • MILLING • TAPPING
in ONE *cycle of the* INDEXING DIAL

From the smallest commercial sizes to ½" dia. and 3½" in depth, holes may be drilled and tapped by 6 to 8 tools operating simultaneously . . . automatically. This means thousands of finished parts per hour, each one processed several times.

Moreover . . . NEW OPERATORS may be quickly trained . . . a feature of the utmost value under present labor conditions.

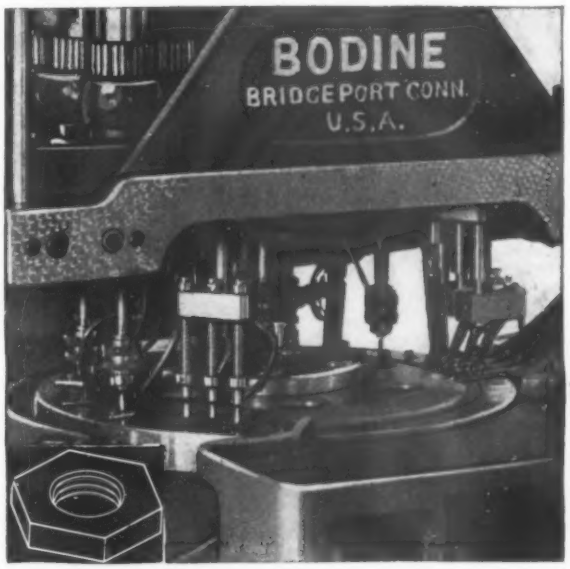
Bodines are standard in six sizes, Nos. 40-10 to 48-30. Up to 8 spindles may be operated at different speeds with a wide diversity of tooling set-ups. The taps reverse at approximately double the advance speed, thereby saving time. Construction permits accurate timing to eliminate tendency to "drag" or distort threads.

Machines require little space on crowded production floors—54" x 60" to 90" x 96" for the respective six sizes.

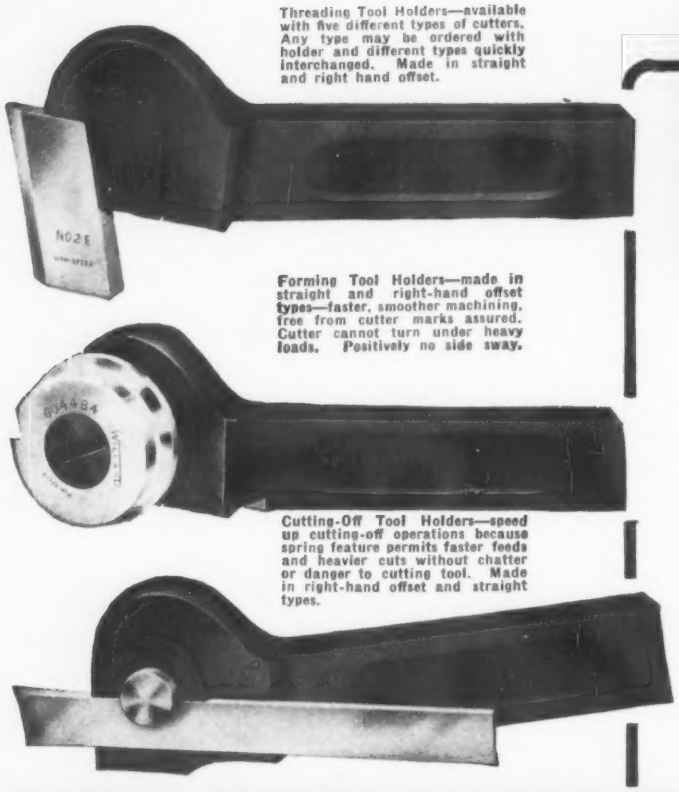
FOR EXAMPLE . . .

Above is shown the Bodine #42-20 machine set up to produce a stainless steel 8 - 32 Hex nut, as pictured in the closeup tooling view below. It is equipped with automatic hopper feeding device and tooled to tap and retap to close tolerances. Nut blanks are fed three per stroke to the dial. First three tapping spindles each tap one nut at their respective stations, then dial indexes and second three spindles retap the nuts to accurately size them. The pieces are automatically ejected at a high rate of speed for stainless steel.

This is but one set up for one of the six sizes of Bodine machines. Ask for completely illustrated catalog and specific engineering recommendations from your blueprints or sample part.



THE
Bodine
CORPORATION
BRIDGEPORT CONNECTICUT
AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES



Threading Tool Holders—available with five different types of cutters. Any type may be ordered with holder and different types quickly interchanged. Made in straight and right hand offset.

Forming Tool Holders—made in straight and right-hand offset types—faster, smoother machining, free from cutter marks assured. Cutter cannot turn under heavy loads. Positively no side sway.

Cutting-Off Tool Holders—speed up cutting-off operations because spring feature permits faster feeds and heavier cuts without chatter or danger to cutting tool. Made in right-hand offset and straight types.

Faster Cutting Speeds and Heavier Cuts with Safety assured by

WILLARD *Spring* TOOL HOLDERS

These modern production aids are making valuable contributions toward winning production battles by eliminating chatter, protecting cutters against breakage and minimizing the chances of spoiled work. By making faster speeds and feeds safely possible, WILLARD SPRING TOOL HOLDERS are finding ever-widening acceptance in automotive, aircraft and other war production shops.

IMMEDIATELY AVAILABLE

Investigate today by sending for Descriptive Circular of WILLARD TOOL HOLDERS for FORMING, THREADING and FORMING TOOLS, CUTTING-OFF TOOLS AND THREADING TOOLS. We guarantee prompt deliveries on a wide range of sizes.

Product of AUTO-ORDNANCE CORPORATION

TRADE MARK Thompson REG. U.S. PAT. OFF.

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Characteristic of the design of all STURDIMATIC LIVE CENTERS is a low overhang and a slight cushioning action . . .
that compensates for expansion due to heat, shock and excessive thrust loads—reducing wear to a minimum. A properly engineered live center is one of the fundamentals of setting up a job and requires a specialist's experience . . . standard shanks with Morse taper carried in stock.

Send us your specifications and blueprints—We will see that your job is set up with the right LIVE CENTER—prompt deliveries on high priorities.

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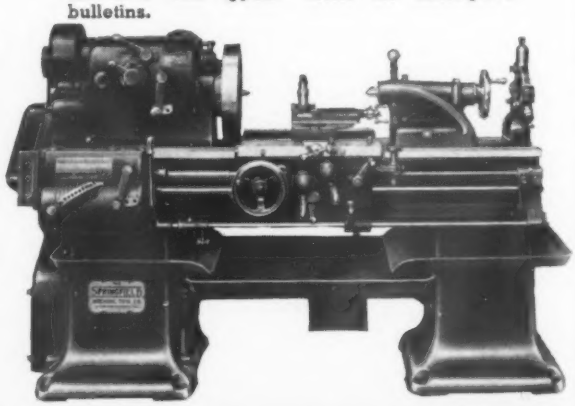
GEARED HEAD LATHES

. . . for peacetime or preparedness production!

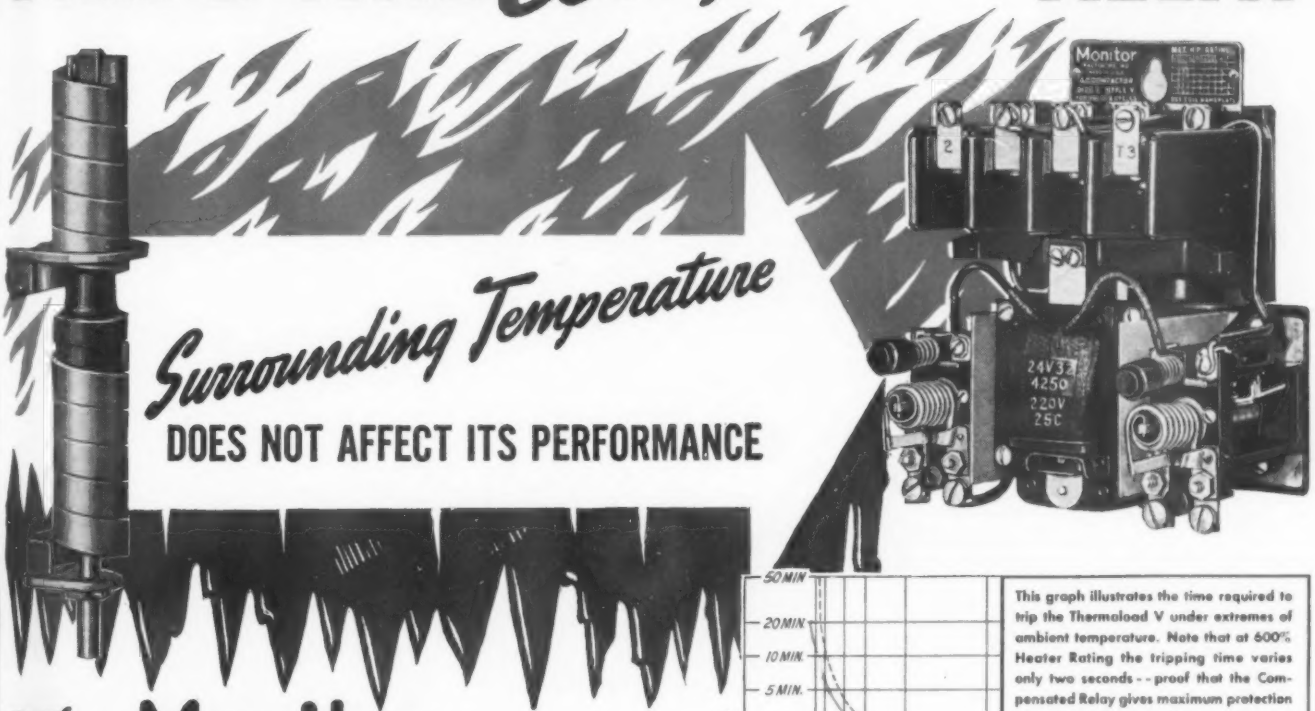
A lathe purchased now . . . for 24 hours a day, 7 days a week operation . . . must still meet your normal peacetime requirements in the future. The flexible, diversified, all-over efficiency of SPRINGFIELD lathes stamps them as ideal for defense and regular production. In all sizes and types. Write for descriptive bulletins.



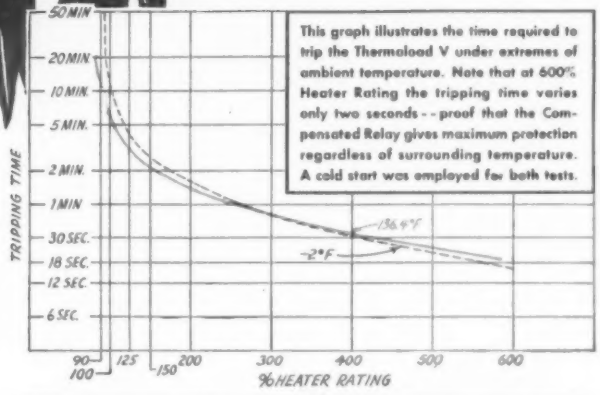
The SPRINGFIELD MACHINE TOOL Co.

SPRINGFIELD, OHIO, U.S.A.

OVERLOAD ALONE TRIPS THIS *Compensated* RELAY



Surrounding Temperature DOES NOT AFFECT ITS PERFORMANCE



This graph illustrates the time required to trip the Thermaload V under extremes of ambient temperature. Note that at 600% Heater Rating the tripping time varies only two seconds--proof that the Compensated Relay gives maximum protection regardless of surrounding temperature. A cold start was employed for both tests.

The Monitor THERMALOAD V

SOLENOID STARTER

(Fully Approved by Underwriters' Laboratory)

The Thermaload V, with exclusive Monitor Compensated Overload Relay, overcomes an important factor in starter performance . . . ambient temperature. In cold locations, the trip is not delayed, in hot locations the trip does not occur until *overload* demands it.

Your motors are guarded against damage . . . you are guarded against unnecessary interruption to production schedules!

Behind the Thermaload V are 55 years of experience in producing quality Monitor Controls . . . your assurance of satisfaction. Specify the Thermaload V . . . for original equipment and replacement.

Complete Technical Data is available from manufacturer or your Monitor Field Engineer.

OTHER FEATURES

- Vertical Straight Line Design
- Double-Break Silver Contacts
- Easily Interchangeable Coils
- Resilient Shock-Proof Mounting
- Tamper-Proof Protection
- Small Size Operating Unit Applicable for 1.5 to 7.5 H.P.—110 to 150 volts. (A.C.) Also available in combination units.

The Monitor Controller Company

GAY, LOMBARD & FREDERICK STS. BALTIMORE, MARYLAND

GET BIG PRODUCTION FROM UNSKILLED WORKERS!
Every dollar invested in

BOICE-CRANE POWER TOOLS

SAFETY-ENGINEERED
PRECISION-BUILT
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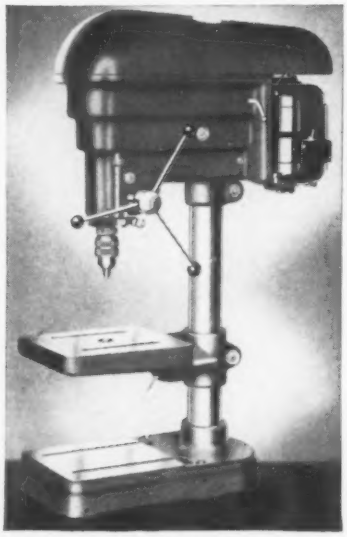
does the work of two spent on oversize machines

You can get QUICK DELIVERY from Boice-Crane

OVER 60 MODELS

BOICE-CRANE No. 2600 HELMET HEAD DRILL PRESS



One, two, three and four spindle types. High and slow speed; bench or floor type; slotted or trough table.

Perfectly balanced and vibrationless.

Sealed against hazards common in other presses. The only drill press priced under $100.00 that gives you an approved guard without extra cost; the first guard that allows easy speed changing.

5 carefully predetermined efficient speeds, one for every operation. New self-centering 30-degree pressure angle 6-tooth involute spline. Spindle, quill, and spindle-pulley are held in permanent, perfect alignment.

The quill, longer and larger in diameter, is held by three bearings, permitting long holes to be drilled more accurately than by other presses in same price range. It is unquestionably the most durable and sensitive of any press in its class.

BOICE-CRANE TAPPING HEADS

Helmet Head Drill Presses

Do light tapping better, cleaner, more economically. Operate at 3000 r.p.m. "IN"; faster than others, and 6000 r.p.m. "OUT". Taps enter every hole centrally without slightest strain. 2 sizes.

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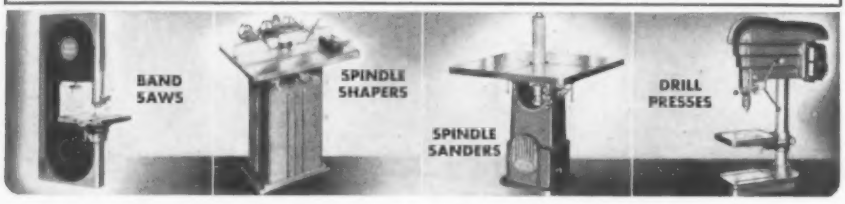

How to save time by doing more reading

That is a profitable paradox for you. More true today than perhaps ever before. For here in the pages of this publication are packed many helpful ideas . . . considerable useful information. Much of it, in fact, available from no other source.

And we most emphatically mean *both* the editorial and the advertising pages.

Just one new idea gleaned from these pages . . . a method for doing something better or faster or easier or at lower cost, may alone save you far more than a year's reading-hours invested in this and other worthwhile business papers.

Many people have found this a fact . . . not only once, but time and time again. That's significant . . . with time so precious today.

*

Good advertising speeds information from those who have it . . . to those who need it.

*

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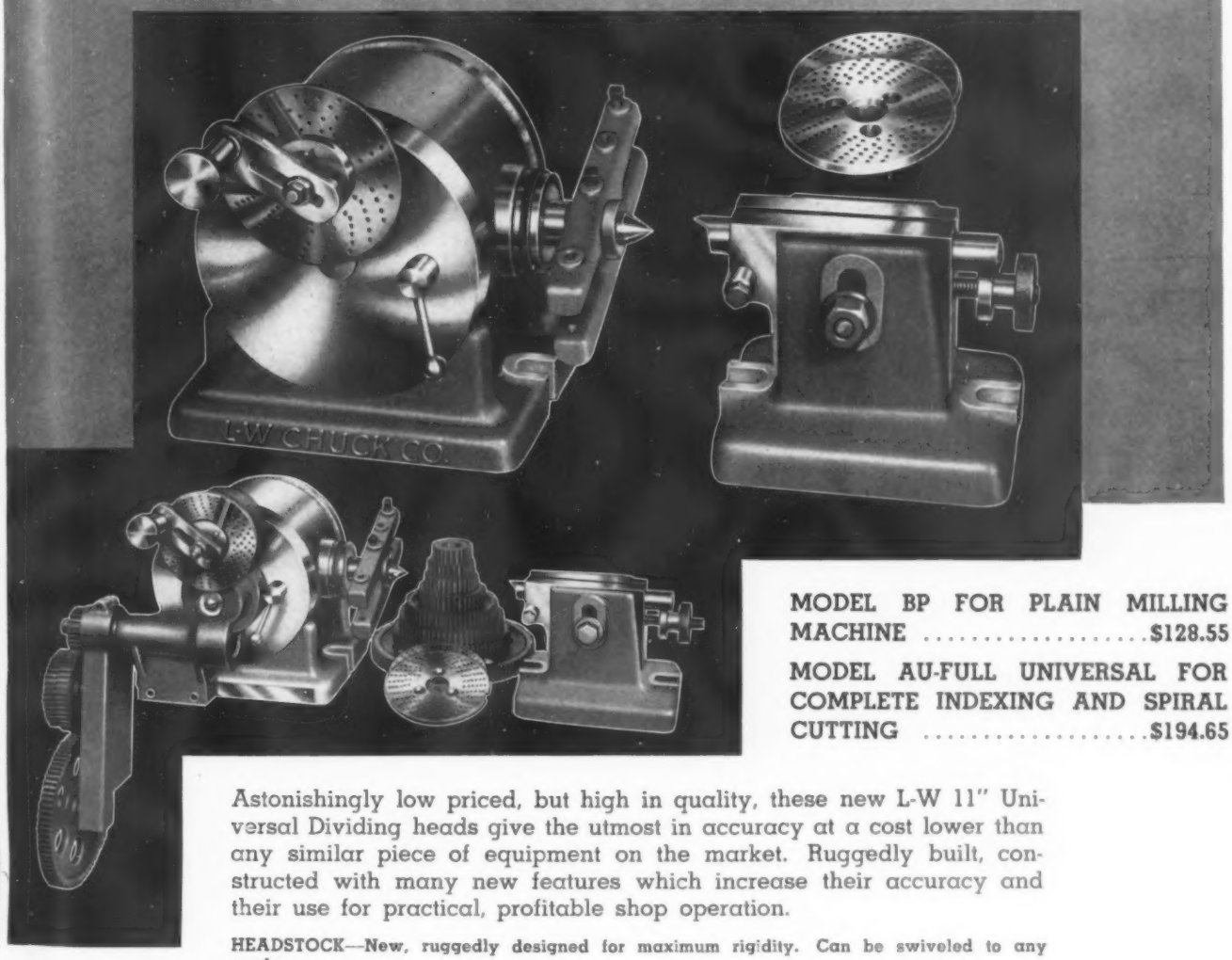
L-W UNIVERSAL DIVIDING HEADS



MODEL BP FOR PLAIN MILLING MACHINE $128.55

MODEL AU-FULL UNIVERSAL FOR COMPLETE INDEXING AND SPIRAL CUTTING $194.65

Astonishingly low priced, but high in quality, these new L-W 11" Universal Dividing heads give the utmost in accuracy at a cost lower than any similar piece of equipment on the market. Ruggedly built, constructed with many new features which increase their accuracy and their use for practical, profitable shop operation.

HEADSTOCK—New, ruggedly designed for maximum rigidity. Can be swiveled to any angle.

TAILSTOCK—New design, heavier and stronger.

HEADSTRONG SPINDLE—Tapered bearings, bored for No. 10B & S Taper. Increased diameter and length. Threaded nose 2¼" diameter 10 thread USS.

WORM—Made from special alloy steel, accurately finished, end thrust taken by ball bearings. Means are provided to make adjustment of worm wheel easily and accurately.

WORM WHEEL—Large diameter, 40:1 ratio, accurately generated, securely mounted on spindle.

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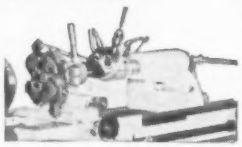
Convert any engine lathe into a turret lathe in 15 seconds with JEFFERSON TURRET ATTACHMENTS. To fit bench lathes and lathes up to 24" swing



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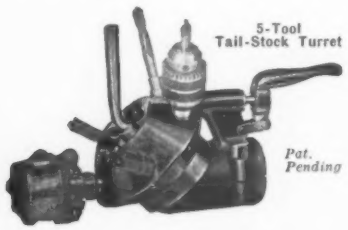

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LIPE Carbo-Matic Lathe

Biting a .040" chip from a shell forging at a speed of 350 surface feet per minute is equivalent to 670 miles of tough steel chips every 168-hour week. That's a sizable record in itself, but multiply it by three years of constant cutting — keeping the tolerance down to a plus or minus .0005" — and you get a better idea of the power, rigidity and stamina built into LIPE Carbo-Matic Lathes.

And those advantages didn't just happen — they were specifically engineered into this lathe to provide the high spindle speeds, the rigidity and precision demanded by carbide tools and by the pressure of emergency war production. That's why the LIPE Carbo-Matic gives you braced and rigid massiveness. Why it has a powerful motor . . . a chatter-free, cone-worm-gear drive! And one man can tend a battery of these lathes. They're fully automatic; all the operator has to do is to load and unload.

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A flexible machine that is the last word in simplicity of operation

HI-SPEED
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for use with any standard make honing head

HONES CYLINDERS up to 24" in diameter . . . with STROKES from 20" to 72" . . .

IDEAL FOR PRODUCTION JOBS INVOLVING:

Aircraft parts . . . Ordnance parts . . . Diesel engines . . . Compressors . . . Pumps . . . Internal combustion engines . . . Steam cylinders, etc.

Speed up war work involving internal cylindrical surfaces by utilizing a HI-SPEED Honing Machine. When used with proper honing head of any standard make, the HI-SPEED machine produces accurate, straight, round, smooth bores—amazingly fast.

Unique positive stop and dwell system makes it possible to stop the spindle without shock or impact at the bottom of each stroke, at any point within the stroke range and hold the spindle without reciprocation, at that point up to 1½ minutes. Ideal for "blind hole" honing and straight line lapping or honing.

All controls are located at the front of the machine at the operator's station . . . No ladders to climb . . . Stroke setting, hone withdrawal, short stroking at any point, changes in speed of reciprocation or rotation of the spindle made instantly from operator's station.

The HI-SPEED Honing Machine is made in 4 sizes, any one of which can be had with strokes up to 72"...Designed for use with any standard make of honing head.

Tell us your requirements—and our engineers will promptly furnish you with complete information, prices and early delivery dates.

Illustrated is No. 0 Machine equipped for 36" stroke with 80" under the spindle.

NOTE THESE SPECIFICATIONS:

Model No.	No. 0	No. 1	No. 2	No. 3
Stroke (standard)	20"	36"	48"	72"
Working Base Area (standard).. Auxiliary Tables available	21" x 22"	31" x 31"	31" x 31"	48" x 54"
Height Under Spindle Nose (up).. Added Height Available on Order.	48"	60"	75"	100"
Spindle Diameter	2¾"	2¾"	2½"	2¾"
Spindle Speeds Through Gear Box	4	4	4	8
Main Drive Motor (standard)	7½ hp	10 hp	15 hp	20 hp
Coolant Pump Volume, Motor Driven	14 gpm	18 gpm	18 gpm	25 gpm
Maximum Bore possible to hone with standard spindle drive motor	10" Dia.	12" Dia.	16" Dia.	20" Dia.
Maximum Overall Diameter of Cylinder possible to place on standard base	18"	27"	27"	44"
Floor Area	44"x60"	60"x80"	60"x80"	60"x108"
Overall Height	11'6"	15'3"	18'3"	23'8"

NOTE: Under our new policy of distribution, sales territories are being assigned to financially responsible, established dealers in the machine tool field. A few excellent territories are still open, and dealers are cordially invited to write us relative to sales representation.

AUTOMOTIVE MAINTENANCE MACHINERY CO.
2100 Commonwealth Avenue, North Chicago, Illinois

MODEL B WET TOOL GRINDER

"Blount"

A sturdy NEW machine for today's needs in hard metal grinding . . . . . .

This recent Blount contribution is a "combination" machine with many new and up-to-the-minute improvements which adapt it to today's fast tempo. With various combinations of wheels to suit special requirements it is a machine of very wide versatility and utility.

Outstanding features include:

heavily constructed column enclosing an ample, easy-to-get-at coolant tank and sludge pan
water pan of generous capacity
motor driven, ball-bearing centrifugal coolant pump
spindles of high carbon steel running in deep-grooved ball bearings
grinding rest of exclusive Blount design, incorporating coolant ejector, which keeps tools cooler and cleans wheel while grinding
motor totally enclosed with manually operated switch and overload protection
magnetic starter or foot treadle switch available at extra cost if desired

Send for Bulletin No. A8 giving complete detailed information.

GENERAL SPECIFICATIONS

Base of column—22" x 19½"
Base to spindle—37½"
Base to pan—33"
Motor—2 HP
Spindle Arbor—1¼"
Wheels—12" x 2" x 1¼"
Between Wheels—22½"
Pan Width—28"
Pan Depth—4½"
Spindle Speed—1759 R.P.M.

J. G. BLOUNT COMPANY *Everett, Mass., U.S.A.*

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TAP GRINDERS for Accurate, low cost tap sharpening

Don't discard dull taps — sharpen them on the chamfer on a Blake Tap Grinder. This versatile machine helps you five ways, (1) it conserves High Speed and Carbon Steels, (2) it increases tap life by thousands of holes, (3) it eliminates delays caused by waiting for new taps, (4) it maintains the accuracy of your products, (5) it is also ideal for grinding countersinks and other small tools.

The Blake Tap Grinder will sharpen right- or left-hand taps with 2, 3, 4, 5, 6, 8 or ten flutes. Capacity is from No. 0 to 2 inches.

Get complete information on the Blake method by mailing the coupon today!

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MADE in all sizes and shapes there is a Macklin Grinding Wheel for every type of grinding job that will show cost-saving results and *"Protect Your Production."* An experienced Macklin Field Engineer is available at all times for the asking—*no obligation.*

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it has to be Accurate

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The blade type diamond tool developed by Wheel Trueing Tool Company has helped to eliminate the difficulties of profile forming of centerless and other types of form grinding wheels.

Easier to set up, truer form and longer periods of use from one tool to the other result in a desirable uniformity and economy of production.

Many wheels are being trued to profile forms to accommodate parts needed in war production and not all forms require the same type of diamond tools.

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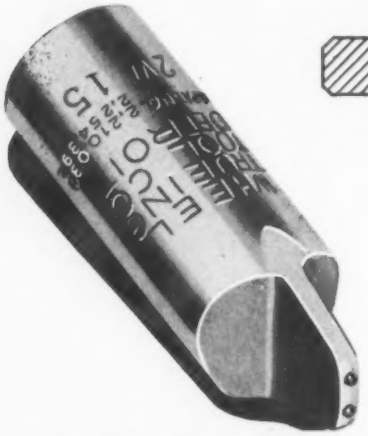

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Specialists in Diamond Tools for Straight, Radial or Step Dressing—Turning, Boring, Radius Forming, Gage, and Core Drilling Tools.

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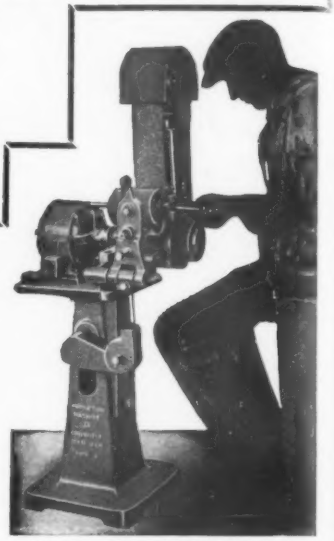
"PRODUCTION" TYPE S CENTERLESS POLISHING and FINISHING MACHINE . . . .

for cylindrical polishing or straight line finishing



Cylindrical work as well as flat and irregular work can be quickly and easily handled on this versatile machine.

Features include quick change from horizontal to vertical machine, a patented centerless feed for automatic handling of cylindrical work and a feed mechanism which can be quickly removed when not required.

Ball Bearing equipped throughout, the Peerless Type "S" Grinder, Surfacer, Polisher and Buffer has a 4" wide (60" long) abrasive belt and a belt speed of 3200 lineal feet per min. Capacity of centerless feed ¼ to 1" dia.

Machine in vertical position for cylindrical work.

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No. 34 (VERTICAL SPINDLE)

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They do a Real Job. Ample power. Good clean cut, without heating the metal. Two sizes, for solids up to 2½" and tubing up to 3½".

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WOMEN DRIVE PHILLIPS SCREWS EASILY!

Now you can recruit women for your screw driving army and be sure of fast, *skilled* work from the very start.

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They cost less to use! Compare the cost of driving Phillips and slotted head screws. You'll find that the price of screws is a minor item in your total fastening expense . . . that it actually costs less to have the many advantages of the Phillips Recess!

KEY TO FASTENING SPEED AND ECONOMY

The Phillips Recessed Head was scientifically engineered to afford:

Fast Starting – Driver point automatically centers in the recess . . . fits snugly. Screw and driver "become one unit." Fumbling, wobbly starts are eliminated.

Faster Driving – Spiral and power driving are made practical. Driver won't slip out of recess to injure workers or spoil material. (Average time saving is 50%.)

Easier Driving – Turning power is fully utilized by automatic centering of driver in screw head. Workers maintain speed without tiring.

Better Fastenings – Screws are set-up uniformly tight, without burring or breaking heads. A stronger, neater job results.

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WOOD SCREWS • MACHINE SCREWS SELF-TAPPING SCREWS • STOVE BOLTS

21 SOURCES

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NOW AVAILABLE FOR USERS OF

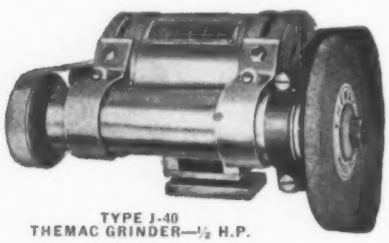
THEMAC GRINDERS

These new operating manuals will be welcomed by thousands of THEMAC users, many of whose names are not on our records because of the fact that these tools were sold by our local distributors.

The value of these manuals to users of THEMAC GRINDERS lies in the practical useful data contained. For example, detailed specifications are given for each tool as well as description of each piece of equipment. Illustrations in diagrammatic form are also included showing all details of design and construction with every part clearly indicated and numbered — data which will greatly assist in simplifying cleaning, lubricating and operating. Included also is a parts list, with each part numbered to facilitate selection of parts needed—a big help when, after long service, replacement parts may be necessary. Availability of spare parts for every machine and prompt service in supplying parts from stock enable Themac users to maintain present machines in service when new tools may not be available.

Available for the following model machines

J-2-A J-4
J-3 J-40
J-30



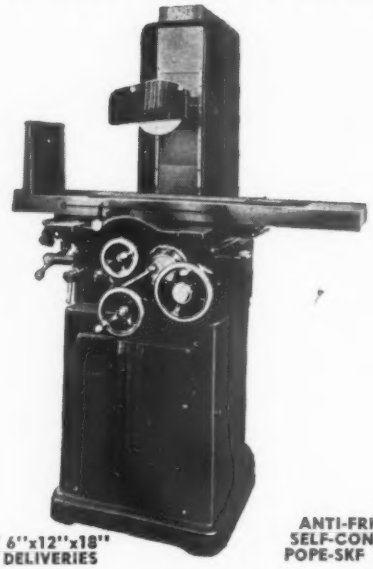
TYPE J-40
THEMAC GRINDER—½ H.P.

The primary purpose of these manuals is to provide users with information that will help them get maximum performance by proper maintenance and assure operation at maximum speed and precision. A pulley combination chart with available speeds also giving size and number of belt required for various speeds is included in each of these manuals. In writing for your copy or copies, kindly advise the type and serial numbers of your Themac Grinders so that we can furnish the Manuals you require.

THE McGONEGAL MANUFACTURING CO.
East Rutherford N. J.

ATLANTIC

No. 2 Automatic Precision
SURFACE GRINDER

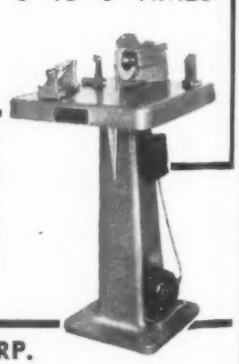


CAPACITY 6"x12"x18"
PROMPT DELIVERIES

ANTI-FRICTION
SELF-CONTAINED
POPE-SKF SPINDLE

ATLANTIC MACHINERY CORP.
149 Broadway New York, N. Y.

CUTTER LIFE EXTENDED 5 to 8 TIMES
with the
BARNES *PRECISION*
CUTTER GRINDER



Highly efficient for grinding formed cutters, gangs of form or plain cutters, plain cutters, shank cutters, plain or tapered reamers; makes possible the use of profile ground formed cutters. No need to change existing cutter equipment. Form relieved cutters, sharpened on the "Barnes" become profile cutters. Quality and quantity of work produced greatly increased. Accuracy absolutely assured.

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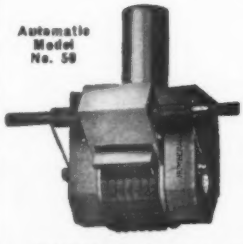
NUMBERALL Numbering Machines

For stamping into metal etc.

Automatic Model No. 50



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All sizes of figures.
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Grand Rapids Grinders

ARE Speeding AIRCRAFT and ENGINE PRODUCTION . . . . .

Manufacturers like these are using GRAND RAPIDS GRINDERS for PRECISION PRODUCTION

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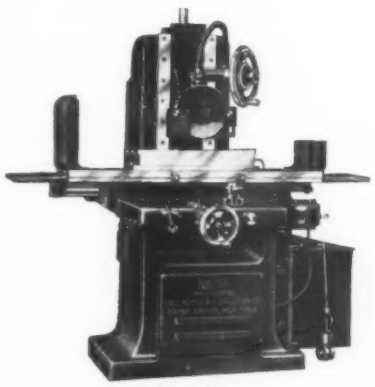
★ GRAND RAPIDS Grinders are playing a tremendous part in maintaining the speed and accuracy so essential to aircraft and engine production. In tool rooms or on production lines, GRAND RAPIDS machines are grinding to extremely close tolerances. They are fulfilling every requirement for precision work. They are precision machines—fast, convenient, making it possible to meet difficult production schedules under all conditions. There's a GRAND RAPIDS Grinder for every class of armament production.



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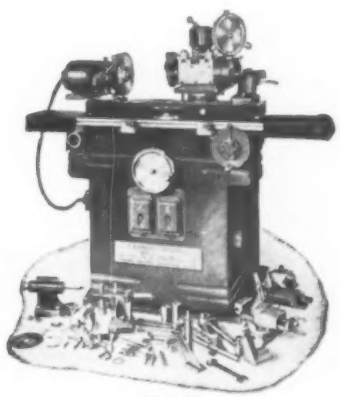

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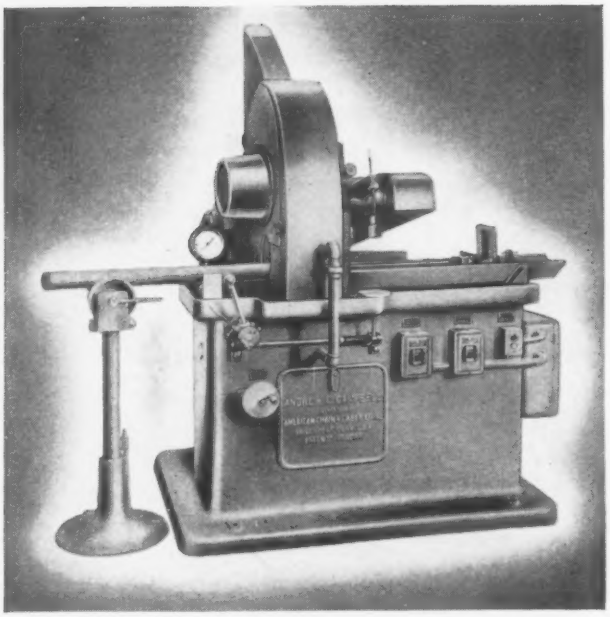

No. 401 CAMPBELL CUTAMATIC. Abrasively cuts steel up to 6" dia. Hydraulic Clamping and wheel feed. Proper coolant control.

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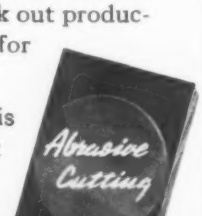
CAMPBELL offers the only complete range of Abrasive Cutting Machines—8 types, 19 models.

You will find it worthwhile to check with the CAMPBELL Engineering Department on *your* abrasive cutting whether you cut any grade of steel, annealed or unannealed; non-ferrous alloys—solid bar, tubular or flat.

Send us complete data—material, size, length before cutting, length of cut-off pieces, production required per hour. With that as a starter, we will work out production procedures and costs for you.



Be sure to get a copy of this new authoritative booklet *"Abrasive Cutting"* — 28 pages of valuable data for anyone doing production cutting.

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ALSO MAKERS OF A COMPLETE LINE OF NIBBLING MACHINES

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FINISHING DIES IS A PAINSTAKING JOB

Photo Courtesy Bell Aircraft Corporation

THIS airplane worker is finishing up a die for a fuselage part for Bell Airacobra P-39 pursuit planes. It's just another instance of how Bell Aircraft is speeding production with the help of improved finishing operations.

Finishing the die is a painstaking job calling for specialized skill. The rough casting must be scraped and then sanded and finished with coated abrasives to give the required fidelity to the specified contours and to produce the smooth surfaces necessary for perfect stamping operations.

This process is speeded by using Aloxite Brand Aluminum Oxide Coated Abrasives in various forms specially adapted to the different contours encountered. Abrasive discs, No Lap bands and cloth sheets are used as the particular operation requires. Net result to Bell: speed-up of the die preparation process and saving of precious man-hours for tooling operations.

The Carborundum Company has been a leader in developing a number of new forms of coated abrasives to meet the requirements necessitated by war production. A number of these items are described in our pamphlet "Weapons for Production." Send for your copy.

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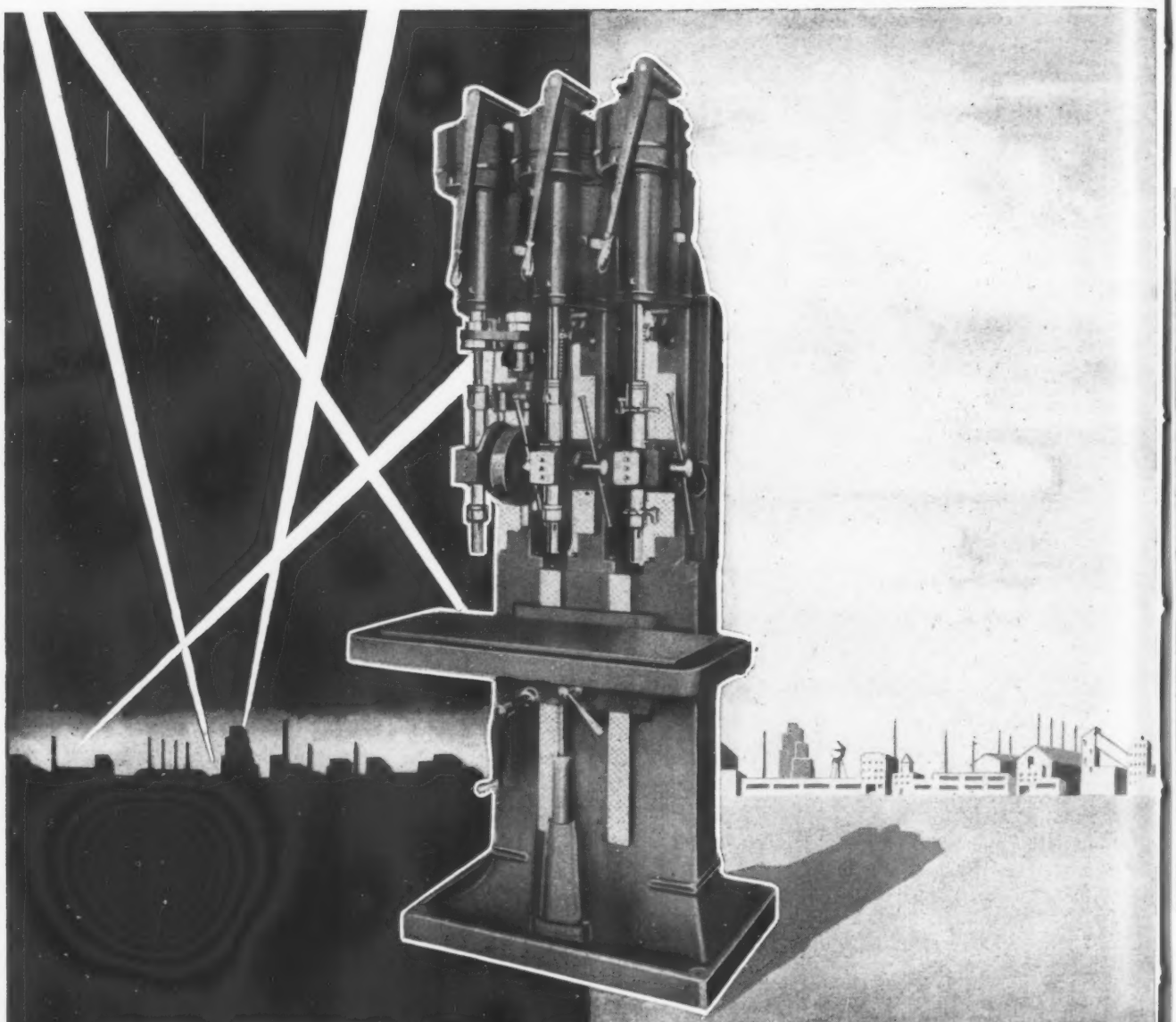

IN WAR OR PEACE

Today, men are studying post war problems. You, too, are undoubtedly giving this problem equally serious consideration. One problem can be solved now. The standard design of the Avey Type MA-6 Drilling Machine is easily adaptable to your War or Peace Production line. The advantages of a drilling machine that requires no elaborate and expensive changes have been appreciated by many of America's leading industries.

This Avey Drilling Machine, Type MA-6, is now being built in No. 2 size (capacity in cast iron ⅞ in.). No. 3 size (capacity in cast iron, 1¼ in.). One to six spindle units, either size. Six speed machine, two speed motor with three mechanical changes through gearing. Speed range is eight to one. Push button control. The above photograph shows the MA-6 equipped with three spindles, the Avey-matic Feed, Hand Feed and Tapper.

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Now O. B. A. speeds threads through "finishing school"

THEY'RE getting better ordnance faster today because so many tedious thread-cleaning jobs have been shouldered by Osborn power-driven Brushing Wheels. Here's an example:

At a midwestern plant doing close-tolerance ordnance work Osborn Brushing Specialists were conducting an O.B.A. (Osborn Brushing Analysis) to determine exactly where and how brushing could improve quality and step up production. They found a frantic search going on for a method of removing burrs and metallic fuzz from a threaded part so that it would "spin-down" on the inspectors' ring gauges, and still hold tolerances as required. To get clean, smooth, free-running threads the shop had tried every practical cleaning method they knew of, but without success.

The Osborn men suggested a standard Monitor Section Brushing Wheel with fine, crimped wire. Tests were run off immediately. Not only did the brushed part pass the "spin-down" test, but the operator found he could finish half a dozen pieces in the time it took to finish one by the fastest previous method.

Osborn maintains Brushing Specialists in every section of the country to aid in solving burring, cleaning and finishing problems for war plants. For details of the O.B.A. (Osborn Brushing Analysis) or help on specific operations, get in touch with the Osborn representative in your district. *The Osborn Manufacturing Company, 5401 Hamilton Ave., Cleveland, Ohio.*

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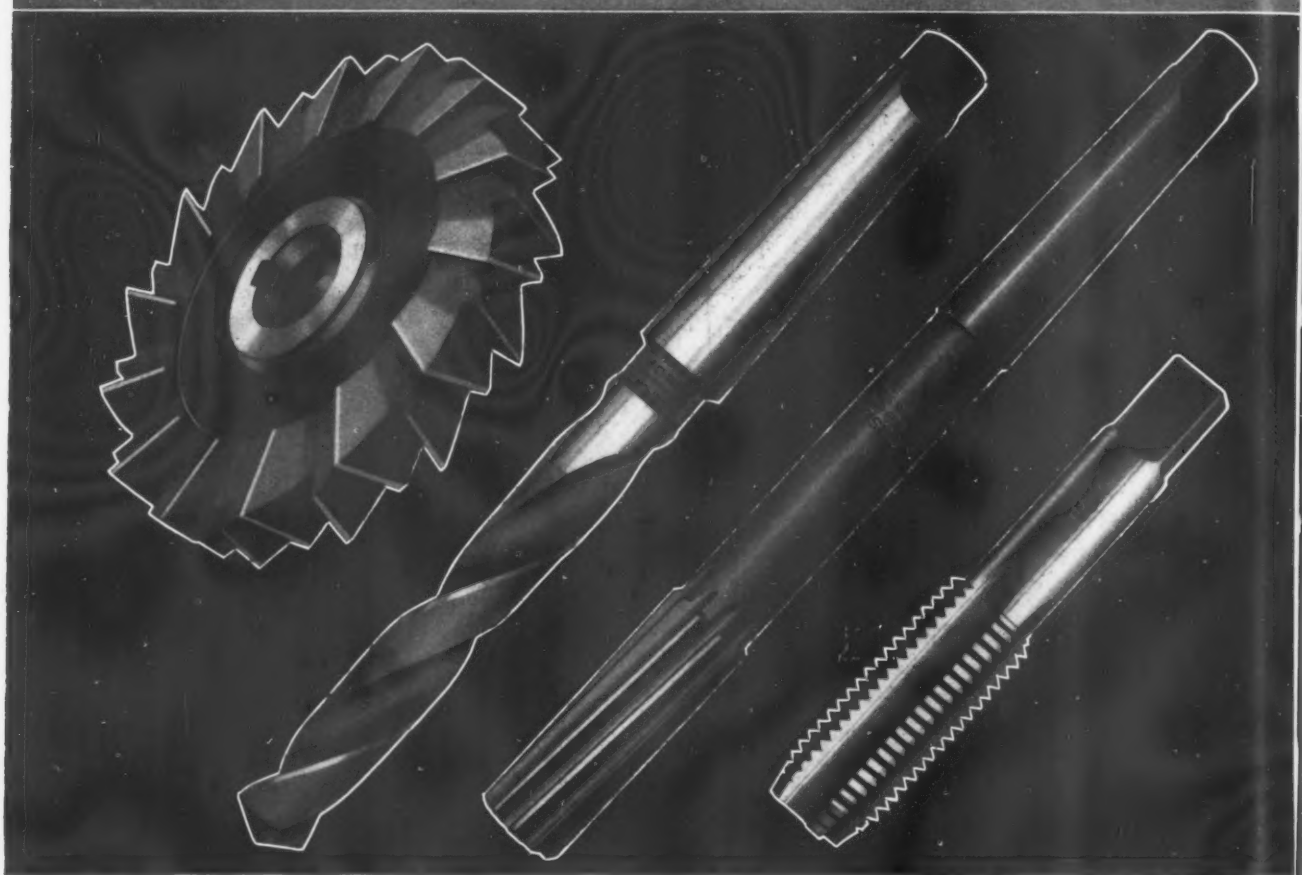

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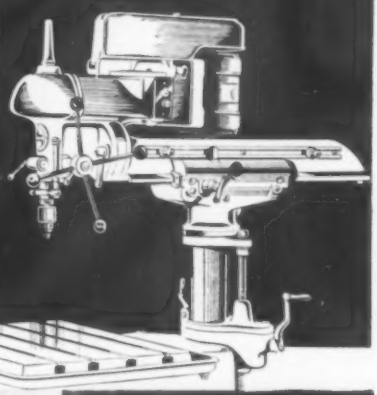

INTRODUCED at the height of the American war expansion program, the Walker-Turner Radial Drill filled a need so widely recognized that its acceptance was immediate and overwhelming. After two years of intensive job-testing, it is still without a peer in its field. During this time, it has served to straighten out kinks in many overcrowded production lines. Aircraft plants, shipyards, tool rooms, metal fabricating plants of all kinds know the unique usefulness of this fast, rugged, versatile radial drill. There's a place in your shop, too, for this hard-working machine tool.

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Photographs courtesy Lockheed Aircraft Corporation. The Walker-Turner Radial Drill is used for fast, light drilling, tapping and routing. Drills to center of 62" circle. Head tilts to 45° right or left. Spindle speeds 160 to 8200 r.p.m. Price $352.50. Prompt shipment to war industries.

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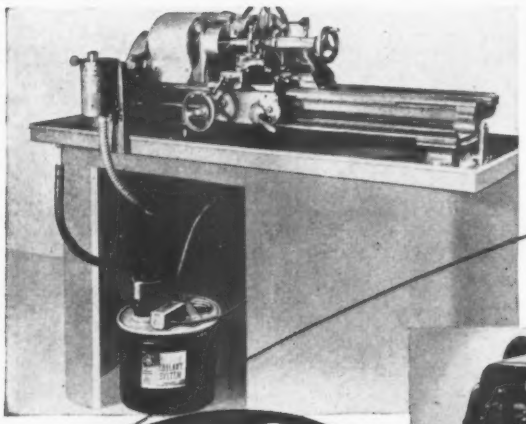
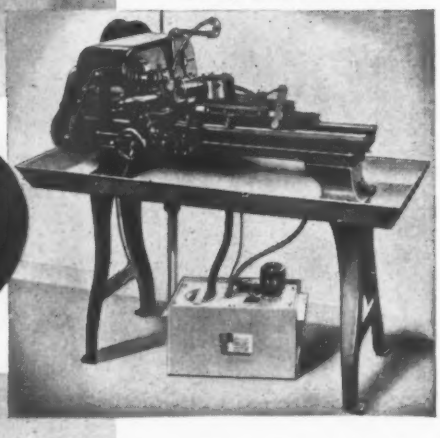
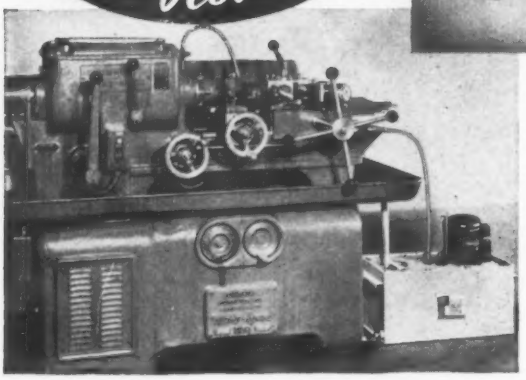


Gray-Mills *Portable* COOLANT SYSTEMS



HELP good LATHES do their best



Gray-Mills Self-contained Coolant Systems operate independently of the machine tool and thus assure complete freedom from unnecessary vibration and accuracy-destroying motor harmonics.

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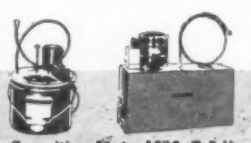

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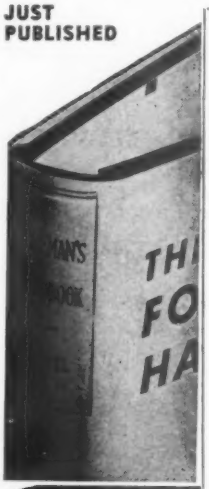

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Steel Forged Connecting Rod for Gasoline Engine with Babbitt Main Bearing and Bronze Wrist Pin Bushing.

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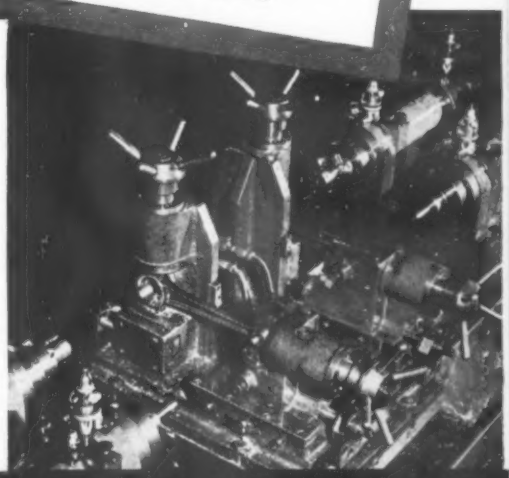

Special 3-Center Holding Fixtures for each end of the machine. The two ends alternate in the boring cycle, each end boring wrist pin and main bearing simultaneously.

Two operators maintain production of 70 connecting rods per hour. Actual boring time of each piece is 32 seconds complete.

In the plant of this gasoline engine manufacturer, both wrist pin and main bearings in connecting rods are bored simultaneously on a No. 2U Stokerunit Simplex Two-Way Four-Spindle Precision Boring Machine. The two double-spindle ends of the machine alternate in the roughing and finishing operations.

Here is the interesting operating cycle in this installation as handled by two operators:

FIRST SPINDLE—Rough boring babbitt bearing; stock removal 1/32". Also facing and chamfering one side of bearing.

SECOND SPINDLE—Finish boring wrist pin end of rod in steel forging (230 Brinell); stock removal .010". Bore is .875" dia. by 1" long.

At this point, one operator removes the rod and presses in the bronze wrist pin bushing, while the other operator loads the machine for the initial operations.

THIRD SPINDLE—Finish boring babbitt bearing; stock removal .005". Bore is 1.752" dia. by 1 1/8" long. Also facing and chamfering other side of bearing.

FOURTH SPINDLE—Finish boring bronze bushing on wrist pin end of rod; stock removal .004". Bore is .750" dia. by 1" long.

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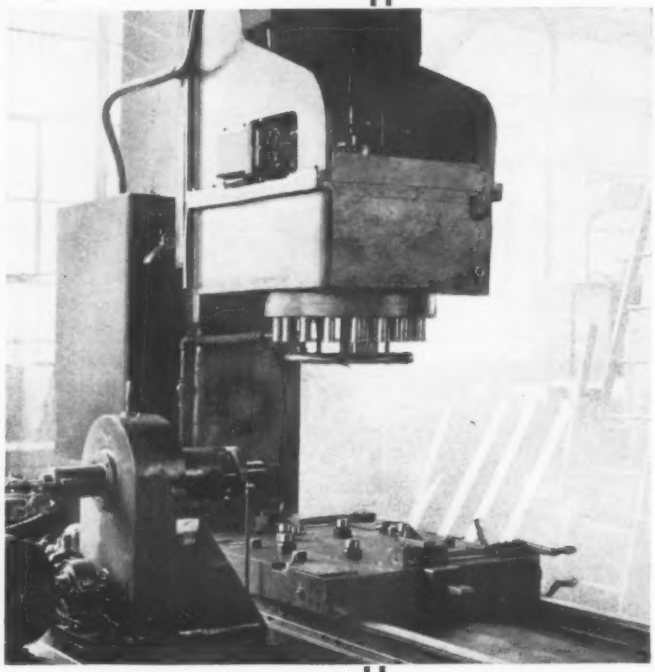

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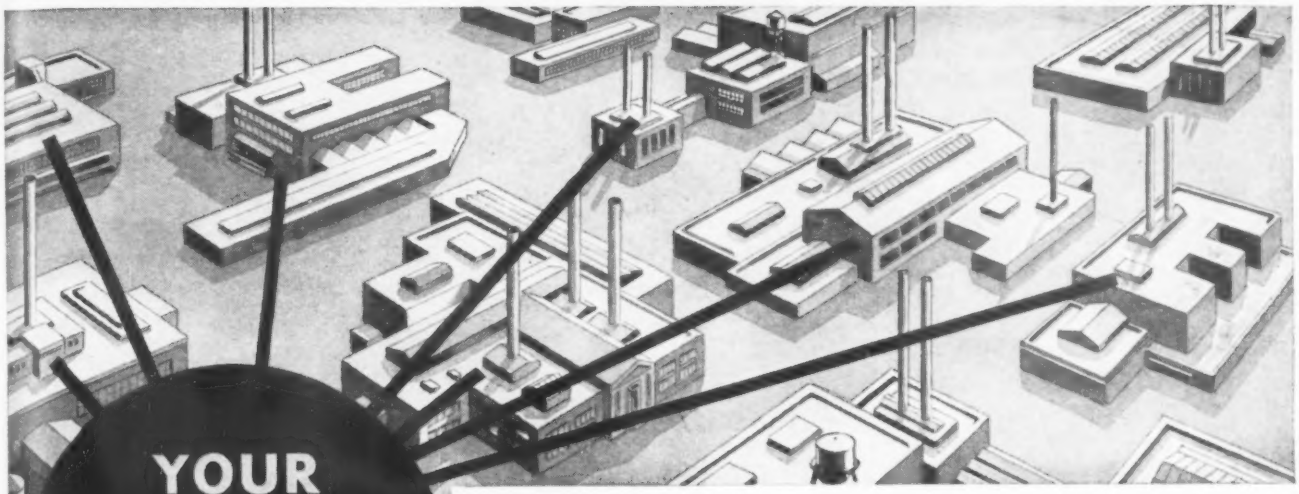

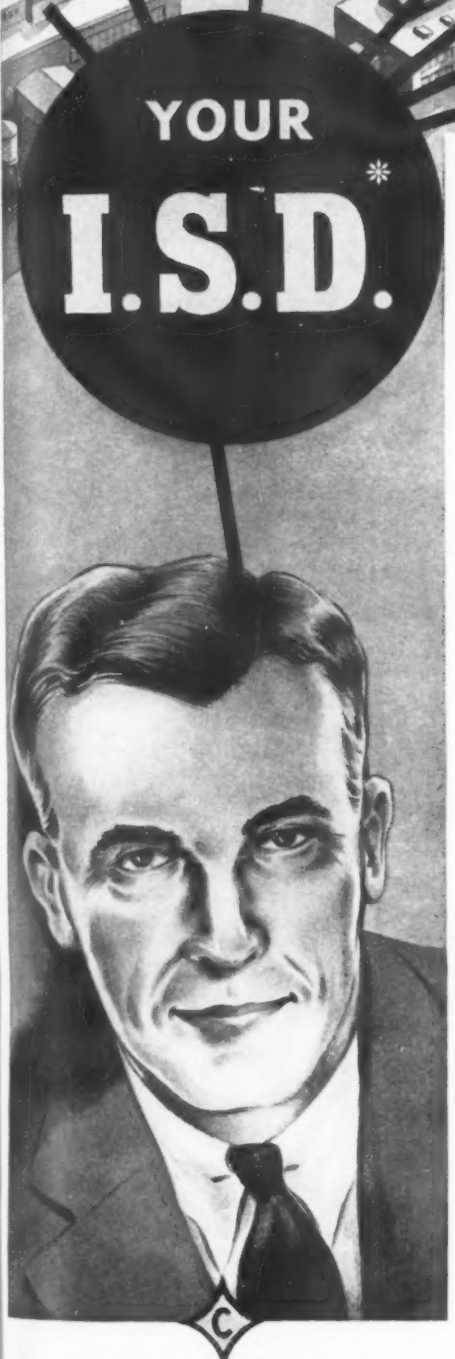

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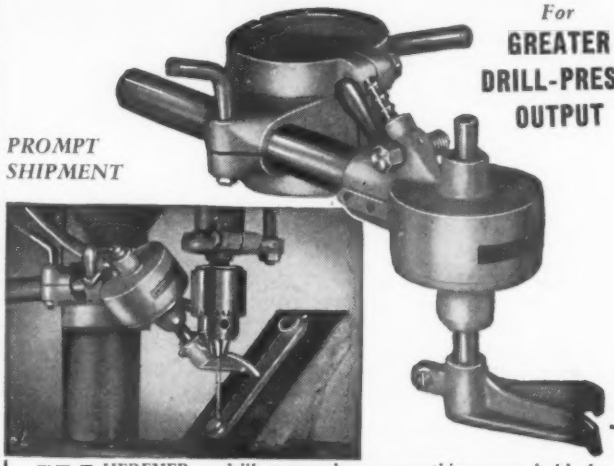

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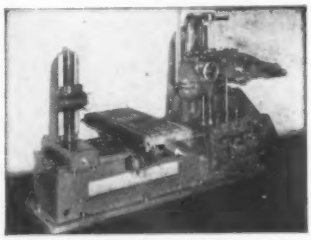
Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.



Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.

BAUMBACH
STANDARDIZED DIE SETS

BETTER-MADE
DIE SETS
AT LOWER COST

46 Styles—195,000 Sizes

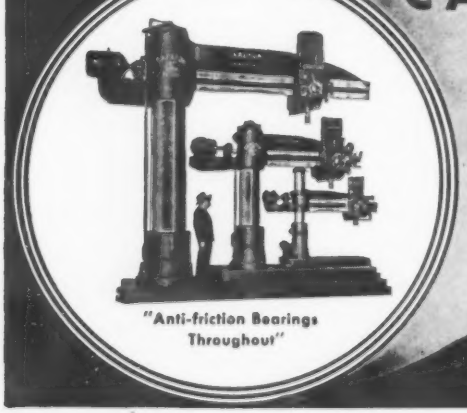
E. A. BAUMBACH MFG. CO.
Machined Steel Drop Forged Steel Semi-Steel
Send for our new catalog
1812 South Kilbourn Ave., Chicago, Ill.

DIES GEO MET RIC *TAPS*

Right from the Lead

THE GEOMETRIC TOOL CO.
NEW HAVEN, CONN.

CARLTON RADIAL DRILL



"Anti-friction Bearings Throughout"

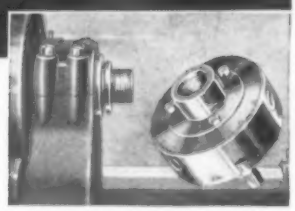
FEATURES—1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

The
CARLTON
MACHINE TOOL COMPANY
CINCINNATI, OHIO, U. S. A.

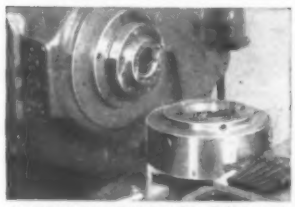
ARMY E NAVY

mount 'em properly...

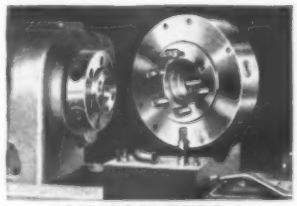
and you can ride 'em hard



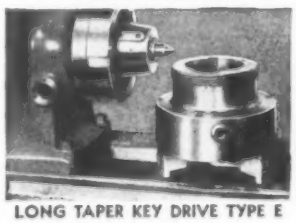
THREADED SPINDLE NOSES



AMERICAN STANDARD TYPE A-1



CAM LOCK TYPE D-1



LONG TAPER KEY DRIVE TYPE E

WHEN you mount a chuck on a machine tool spindle, you're doing a PRECISION operation . . . one that controls in a large measure the accuracy of the work that the machine tool will turn out.

Of course, with the modern, simplified, quick-mounting spindle noses such as the four standard types shown on this page, the job has been made very quick and easy. But it is still . . . in fact, even more so . . . a PRECISION operation. A few times of "slapping her on" without making sure that *all* bearing surfaces are absolutely *free* of dirt or chips . . . a few times of wrenching up tight before being properly and truly seated . . . will do damage that will plague you for evermore.

MAKE SURE EVERY OPERATOR, EVERY TIME, DOES THIS:

1. Carefully wipes clean all bearing surfaces with a soft clean cloth.

2. Takes the few extra seconds to bring chuck onto spindle slowly and carefully.

3. Tightens all bolts "progressively", first a few turns on one, then a few turns on the next, till all are uniformly tight.

4. NEVER force a chuck into position. If it doesn't "go" smoothly, something is wrong.

We are anxious to help you, not only to secure the essential chucks you need, but also to make sure that every chuck is doing its job most efficiently. We will be glad to send you reprints of this advertisement and copies of our "Chuck-Check" cards on request. The Cushman Chuck Company, Hartford, Conn.

These small cards can be given to operators or put on bulletin boards. They'll help save time, save chucks and reduce spoilage.

CUSHMAN

A World Standard for PRECISION

CARD DIES

Stand the gaff of toughest threading demands . . . . . .

Under today's conditions, when quality must be maintained regardless of quantity demands, it is good to know that CARD DIES can be depended on for production threading.

The CARD line includes Spring Screw Threading Dies of carbon steel in machine screw and fractional sizes, Adjustable Round Split Dies for both hand and screw machine work in machine screw, fractional, and pipe sizes.

In addition CARD manufactures Hexagon Rethreading Dies, Solid Square Pipe Dies and Bolt Dies.

Consult the Card Catalog for your requirements. Send for your copy today.

CARD DIES ARE AVAILABLE THROUGH LEADING DEALERS

The CARD Quality

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Mansfield, Mass., U. S. A.
DIVISION OF UNION TWIST DRILL CO.
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Seattle: 568 First Avenue, South Los Angeles: 168 South Central Avenue San Francisco: 121 Second St.

ERRINGTON

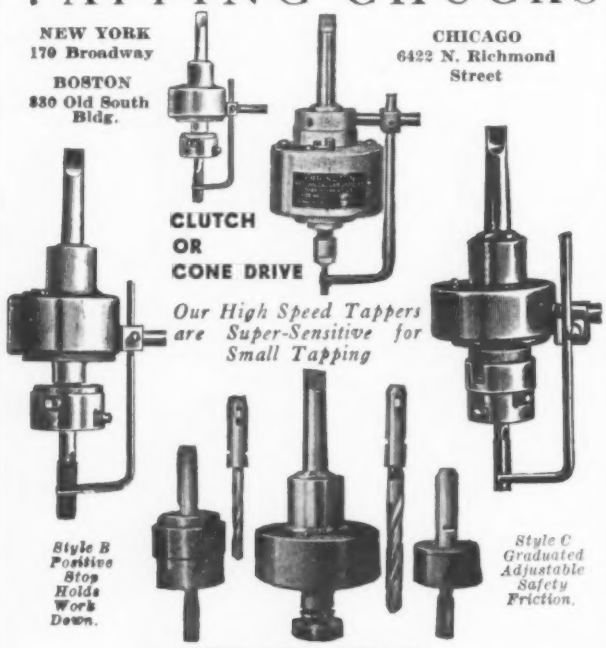
Main Office and Works, Stapleton, Staten Island, N. Y.

TAPPING CHUCKS

NEW YORK
170 Broadway

BOSTON
830 Old South Bldg.

CHICAGO
6422 N. Richmond Street



CLUTCH OR CONE DRIVE

Our High Speed Tappers are Super-Sensitive for Small Tapping

Style B Positive Stop Holds Work Down.

Style C Graduated Adjustable Safety Friction.

DRILL PRESS TURRET

Style D-E with Quick-Change Tool Holders to Drill, Tap and Set studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustments in each tap-holder, if required.

Also, Opening Die-Heads; Opening Stud-Setters; Friction Screw-Drivers and Nut-Setters, etc.

LUCAS "PRECISION"

Horizontal Boring, Drilling and Milling Machine

THE LUCAS MACHINE TOOL CO.

NOW AND ALWAYS OF

CLEVELAND
OHIO, U. S. A.

HOLMAN

BETTER, FASTER HOLE FINISHING

HELICAL TAPER PIN REAMERS

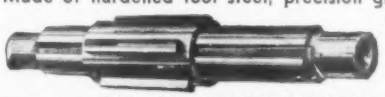
Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

HOLMAN REAMER CO.
MANCHESTER, CONN.

Production Goes *UP* . . .
Production Costs Go *DOWN* . . . with
NICHOLSON *Expanding* MANDRELS

Time-saving economy tools for holding work while being machined between centers on lathes, grinders, millers, shapers, etc. Made of hardened tool steel, precision ground.

Sold singly or in sets.



Prompt Delivery. Bulletin No. 741

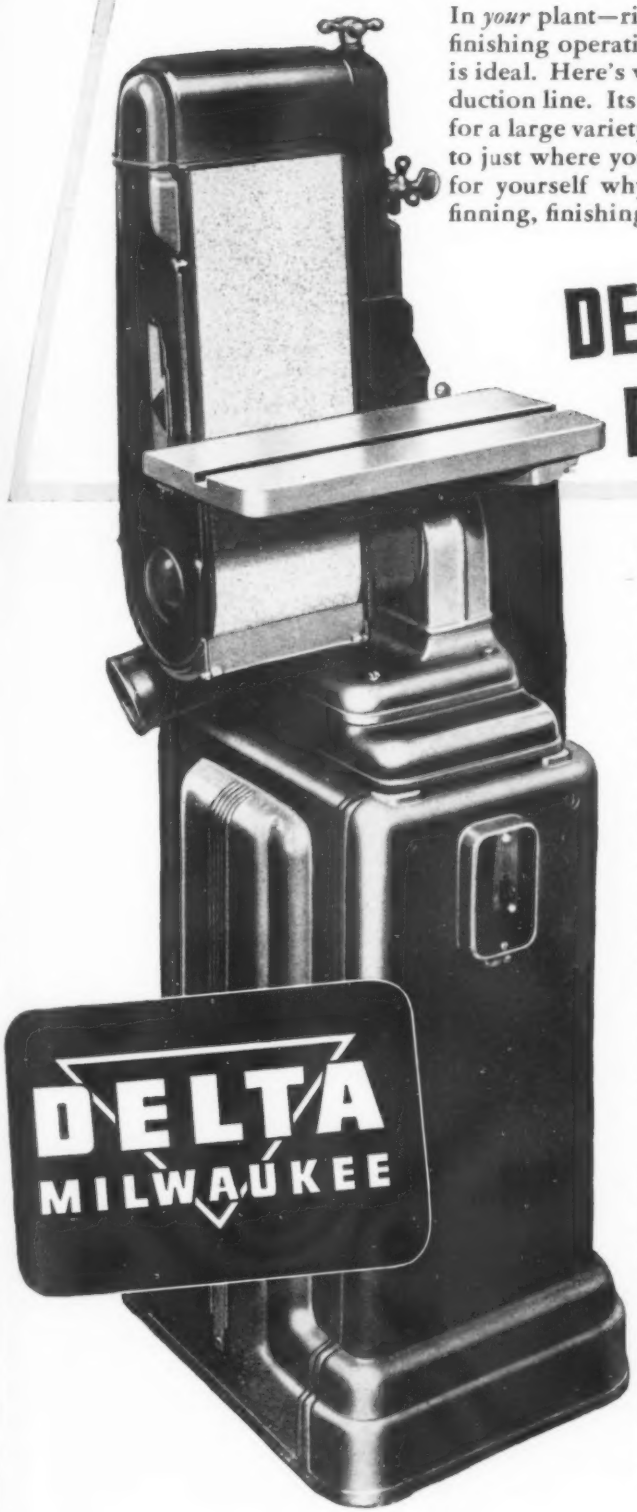
W. H. NICHOLSON & CO.
114 OREGON ST., WILKES-BARRE, PA.

Other Products: Arbor Presses—Control Valves—Steam Traps—Floats Flexible Couplings—Compression Shaft Couplings

A Practical Solution for many Finishing Problems

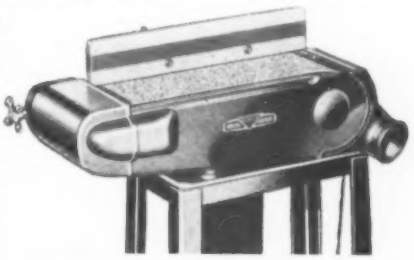
In *your* plant—right now—there are dozens of sanding, polishing and finishing operations for which this Delta Abrasive Finishing Machine is ideal. Here's why: It is husky enough to stand the grind of the production line. Its advanced design permits quick, accurate adjustments for a large variety of jobs. It is light enough to be easily moved around to just where you need it, and the price is surprisingly low. Find out for yourself why thousands of shops have found it so efficient for finning, finishing and surfacing metal and plastic parts.

DELTA ABRASIVE FINISHING MACHINES



Embodies Basic New Features

Every feature has been designed to eliminate disadvantages usually found in belt polishing machines. The frame is heavy and substantial; the adjustments are convenient and positive in action; attachments are quickly attached or removed; the machine may be used either vertically or horizontally, as required. Adjustable fence for edge sanding and adjustable back stop for flat sanding are available for use in horizontal position. Entire machine is completely enclosed and guarded in accordance with all safety requirements. Dust removal may be made efficiently. It is completely ball-bearing equipped with double-seal bearings, lubricated at the factory for life. There is no rubber covering required on the drums which eliminates one source of replacementexpense.Has many other features.



Send for NEW Catalog

giving full details and prices on Delta Abrasive Finishing Machines—and also showing full line of Delta drill presses, grinders, band saws, and other Delta low-cost machine tools. Get in touch with nearest Delta Industrial Distributor or send coupon below.

THE DELTA MANUFACTURING COMPANY
608-D Vienna Ave., Milwaukee, Wis.

Please send me your new Catalog giving full details and prices on Delta Abrasive Finishing Machines, and your full line of low cost machine tools.

Name .....

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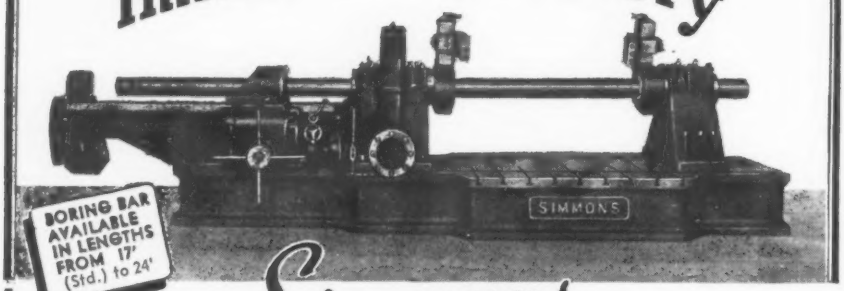
City ..... *State* .....

Immediate Delivery



BORING BAR AVAILABLE IN LENGTHS FROM 17" (Std.) to 24'

Simmons
6" BAR HORIZONTAL BORING and FACING MACHINE
with Micro-Feed Unit

SPECIFICATIONS

Diameter, Boring Bar	6"
Travel of bar in one setting	60"
Capacity of facing heads	9" to 38½"
Widened portion of bed	51½" x 68", 18" high

Write TODAY for descriptive bulletin.

READILY adaptable to many current production problems, this 6" Bar Horizontal Cylinder Boring and Facing Machine is available for *immediate delivery*. Inspection is invited, and we will be glad to discuss its application to your work.

The bed, of massive construction, is heavily ribbed to insure maintained alignment and the boring bar is made of turned and ground high-carbon steel.

By means of Simmons Micro-Feed Unit, an infinitely variable transmission, this boring machine offers both fine and coarse feeds ranging from .004" to 1.000" per revolution of spindle. Main drive to the boring bar is obtained through a motor-driven, six-speed gear box. Gears are of high-carbon steel and mounted on spline-shafts with anti-friction bearings running in oil. Power Rapid Traverse is supplied to the bar in both directions.

AVAILABLE ONLY WITH CENTER SECTION OF BED

SIMMONS MACHINE TOOL CORPORATION
Main Office: 1759 NORTH BROADWAY, ALBANY, N. Y. New York Office: 149 BROADWAY

FOR HOLDING END MILLS AND OTHER TOOLS YOU CAN RELY ON UNIVERSAL COLLET CHUCKS

For gripping a tool "as strong as solid steel itself," you simply cannot beat a Universal collet chuck. The Universal chuck in the operating picture shown is holding a Putnam end mill while roughing cuts in high chrome steel. Universal chucks have ground threads, ample room for tool feed out and nut for Spanner wrench. Write for facts.

PHOTO COURTESY PUTNAM TOOL COMPANY

UNIVERSAL ENGINEERING CO.
FRANKENMUTH • MICHIGAN

HAMILTON-MUEHLMATT

. . . for Speeds Sensitive Tapping

A high production sturdy little machine particularly suited to precision tapping of light work such as instruments, cameras, watches, clocks and business machines. Sensitivity of operation, and high spindle speeds account for accurate work without breakage of fine taps. Can be attached to any light socket. Write for complete information.

The Hamilton Tool Co.
HAMILTON OHIO

LELAND-GIFFORD COMPANY · WORCESTER MASS. U.S.A. · MACHINE TOOLS CRANK SHAFTS

Drilling and Tapping Machines
(Automatic and Semi-Automatic)
LELAND GIFFORD CO.
WORCESTER, MASS.

BARNESDRIL
Honers . . . Drillers
Write Today for Catalog A.

DRILLERS BARNESDRIL HONERS

Barnes Drill Co. 830 CHESTNUT ST. ROCKFORD ILLINOIS, U.S.A.

MILLING

Another UNUSUAL JOB ENGINEERED BY LEMAIRE

Here's a machine designed and engineered to mill slots on huge gun tubes—two in the rear end and two in the breach ring threads.

Through an ingenious arrangement of cutter heads—operating at different intervals—all under automatic control—while the gun is held stationary on the bed—this machine enables the user to perform in less than an hour the work which formerly took him six hours to complete.

Though designed and engineered expressly for milling 90 MM. and 4.7 inch gun tubes, machines of this type can be adapted for use in milling many other large items.

This is only one example of the types of special machines we are daily called upon to design and engineer to meet certain conditions—or solve difficult problems—often developing a machine that combines operations previously performed independently on several machines into an arrangement on a single machine.

The motions of this machine are too complex to describe in full detail in this limited space. We shall be glad to give you this description, however, if you will write us. Perhaps you would like your production materially increased. Perhaps we can design and build a machine to meet your requirements. A consultation with us will not obligate you.

BUY WAR BONDS

LeMaire TOOL & MFG. CO.

2665 S. TELEGRAPH ROAD ▲ DEARBORN, MICHIGAN

ENGINEERS AND BUILDERS OF PRODUCTION MACHINES

NEW *Precision* AUTOMATIC
Solves Tough Jobs Like These-

Product of Two Names Famous for *Precision*

The Original Swiss PETERMANN Model P-7

Re-engineered by GORTON Improved • Modernized

OUR GOLDEN ANNIVERSARY
1893-1943

GORTON ANNOUNCES a new, more versatile Precision Automatic—the Model 16-A Screw Machine. Built to meet America's emergency and post-war critical needs for mass production of extremely small, intricate parts. Long, slender pieces—multiple diameters are finely finished to closer tolerances, in one operation. Unique design offers almost limitless scope in generating any shapes. Present deliveries, 6 to 8 weeks.

THE ONLY SWISS AUTOMATIC BUILT IN U.S. UNDER PETERMANN LICENSE

Exclusive manufacturing rights have been granted to Gorton by S. A. Joseph Petermann, Moutier, Switzerland, through their U. S. distributors, Russell, Holbrook & Henderson.

Gorton 16-A retains all the famous features of the Petermann P-7, with complete re-engineering by Gorton, adding further improvements and refinements.

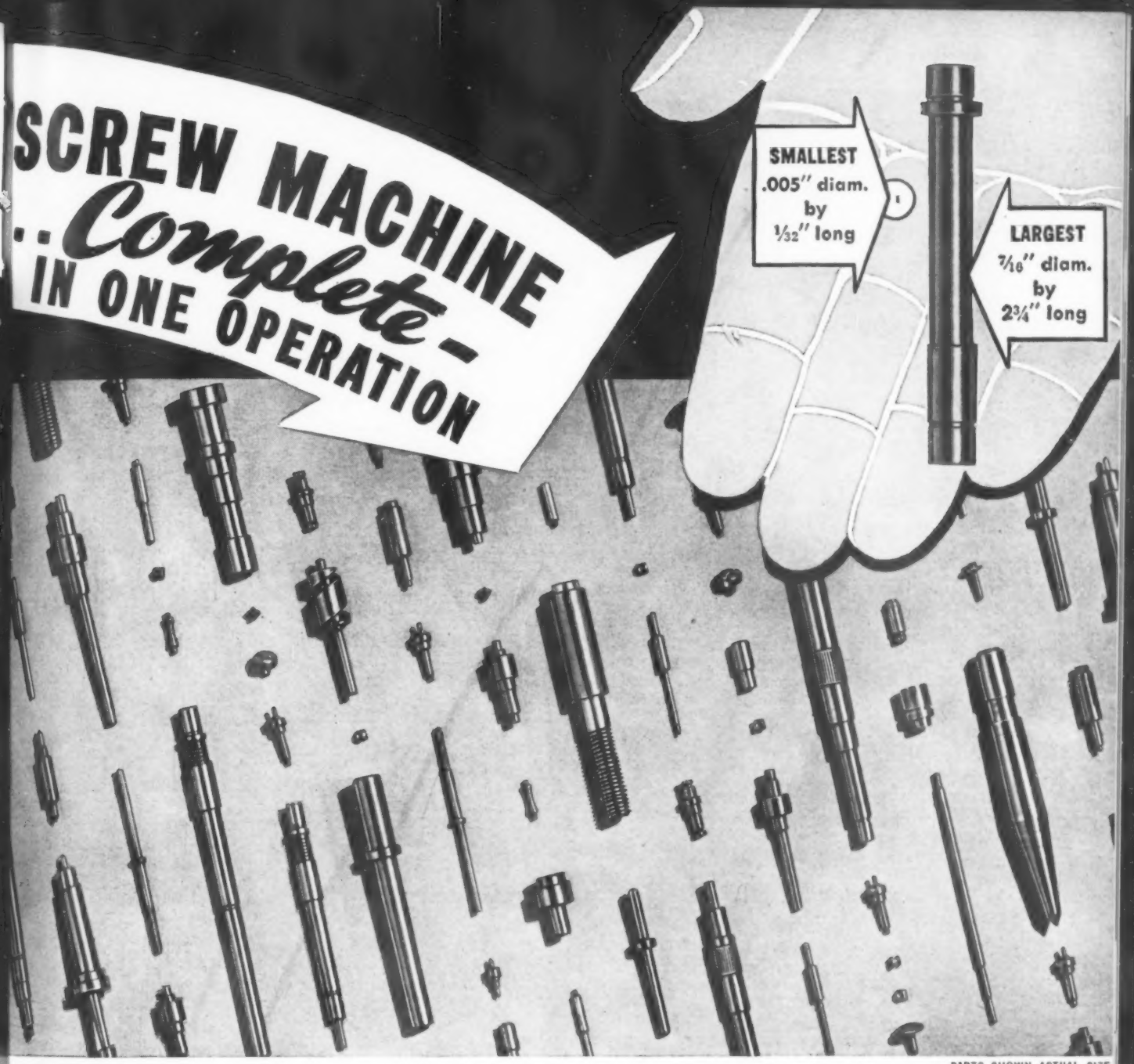
GORTON
50 YEARS OF PRECISION TOOLS

GEORGE GORTON

1315 RACINE STREET

SPECIALISTS FOR 50 YEARS IN REPRODUCING FROM MASTERS

SCREW MACHINE ..Complete- IN ONE OPERATION



PARTS SHOWN ACTUAL SIZE

Exceptional ACCURACY AND QUALITY OF FINISH

High diametrical accuracy—work rigidly supported at point of cutting tool load. Unusually high finish—grinding often eliminated.

LOW TOOL AND OPERATING COST...

Maximum accessibility for quick set-ups. Uses only standard single point tool bits. Micrometer adjustments on every tool. Centralized controls—infinitely variable speeds and cam feeds at touch of dials.

LONG LIFE OF PRECISION PERFORMANCE...

Slow movements—short stroke—freedom from vibration.

COMPLETE TOOLING SERVICE... No charge or obligation.

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Send Coupon Today for **FREE** Bulletin

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GEORGE GORTON MACHINE CO.
1315 Racine St., Racine, Wis.

Send me immediately, complete information with FREE bulletin of specifications and data covering the new Gorton Model 16-A Precision Automatic Screw Machine. No obligation, of course.

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Company.....

Address.....

City.....State.....

MACHINE CO.

RACINE, WIS., U. S. A.

ENGRAVING DIE MAKING VERTICAL MILLING MACHINES

For rapid gaging of INSIDE DIMENSIONS with split-thousandth accuracy

THE TRICO MICRO-CHEK is now in use in more than 2250 war plants to speed up nearly all types of precision gaging. Multiplies dimensions by 200—reducing eyestrain and fatigue.

The new Caliper Type facilitates rapid gaging of internal dimensions, regardless of shape—from 3/16" to 2-1/2"—by means of expanding caliper fingers. Set up ready for use. Applicable to practically any recessed gaging need—replacing plug gages. Adjustable against wear.

TRICO

Write for illustrated booklet showing many applications of Micro-Cheks.

TRICO PRODUCTS CORP.
210 Trico Building, Buffalo, N. Y.

Every Ambitious Man in Industry Should Read this Free Booklet!

"FORGING AHEAD IN BUSINESS" contains FACTS for all thoughtful, forward-looking men; it has a message of particular interest to *technical men.*

This 64-page booklet, of which more than 3,000,000 copies have been circulated, outlines a definite plan of training for your future progress in industry.

Said one man who had sent for it: "In thirty minutes this booklet gave me a clearer picture of my business future than I have ever had before."

Fill in the coupon below and this helpful manual will be sent to you by mail and without cost.

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Dept. 12, 73 West 23rd Street, New York, N. Y.
Please mail me a copy of the 64-page book—
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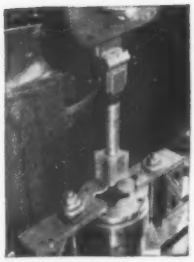
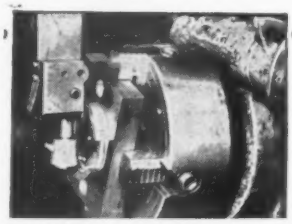


4 *of the many ways* SLOTMASTER can be used to save TOOLS & SET-UPS

Left: Set-up for lapping deep impression die.

Below: Set-up for cutting an internal gear



SLOTMASTER can be used on any round or flat-on round over-arm milling machine and will do precision work that normally requires a multi-thousand dollar machine (all of the working parts are of tool steel, heat treated). It takes but little time to change over from one head to the other . . . the stroke of the ram is adjustable from 0 to 4" . . . the speeds range from 50 to 250 s.p.m. The tool holder is of the clapper box type and can be turned in any position. SLOTMASTER comes complete with pulleys, motor, mounting bracket etc.

Send for 4-page catalog—give specifications of the milling machines you wish to equip. Immediate deliveries on high priorities.

EXPERIMENTAL TOOL & DIE COMPANY
12615 Greiner
Detroit, Michigan

Below: Conventional set-up on a round over-arm milling machine—thumbnail shows a set-up for cutting a spline

NATIONAL KEYSEATING MILLER

. . . the tool that converts drilling machines into key-seaters and saves time and money

• With this modern tool you can handle keyseating jobs not suitable for keyseating machines on any of your drill presses or radials. Keyseats with parallel sides, accurate in depth and in perfect alignment with bore axis are assured.

The National Keyseating Miller mills, keyseats in one cut. It can be used on taper holes, offset holes, blind holes and for taper keys. Work clamping is unnecessary. We also manufacture oil-grooving millers.

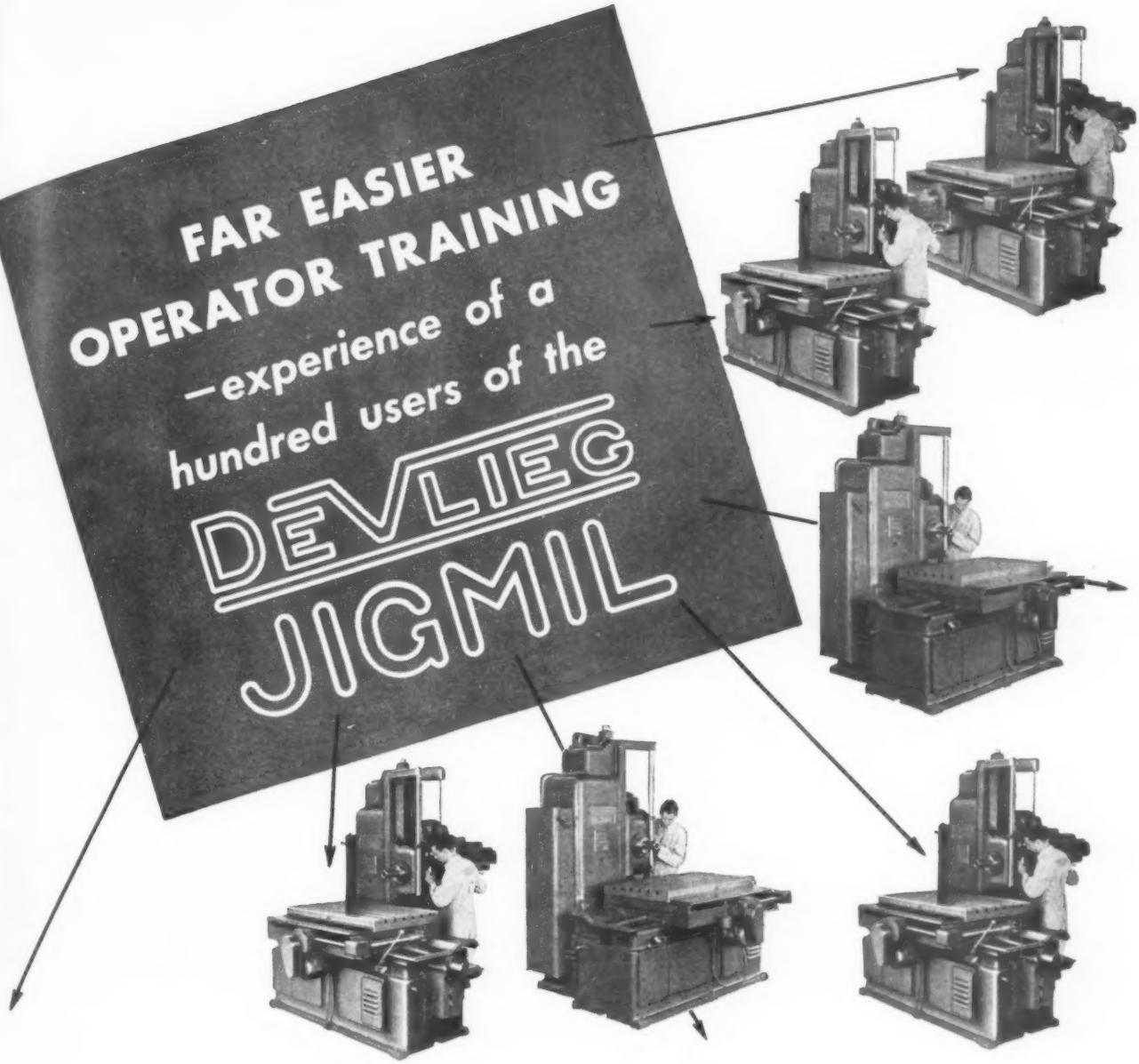
Made in twenty-six different diameters from 1/2" to 3 1/2". Several widths of cutters can be used in each size.

WRITE TODAY FOR OUR NEW CATALOG NO. 15

NATIONAL MACHINE TOOL CO.
CINCINNATI, OHIO

FAR EASIER OPERATOR TRAINING

—experience of a hundred users of the DEVLIEG JIGMIL



Experience of more than a hundred users of the DeVlieg Jigmil has proved that operator training is far easier with this machine—because the Jigmil has built in features of quality that do not require a compromise with operator skill to produce accurate work in high production.

Every frequently used function of the machine is controlled in the master switch on the spindle head—at the operator's fingertips. These include:

Spindle start, stop and reverse.

Power vertical feed and rapid traverse movement.

Power horizontal feed and rapid traverse movement.

Power automatic table retraction and repositioning.

Power feed and rapid traverse to bar movement.

The operator never has to take his eyes off the work—never has to look at controls during operation. The machine is so convenient it gives greatly simplified response to the operator's skill.

An operator learns rapidly—frequently reaches full production of high quality in a week or two.

NEW TYPE MACHINE

Spacing accuracy of a jig borer . . . performance qualities of a milling machine . . . convenience and flexibility of a horizontal boring mill.

New speed of operation—many machines show 75% greater average daily productivity.

Write for Circular

DE VLIEG MACHINE COMPANY

450 FAIR AVE. FERNDALE (DETROIT) MICHIGAN

DEVLIEG MACHINE TOOLS

"ALLENS" facilitate faster, easier resetting of blades on

CONTINENTAL

Inserted Blade

FACE MILLING CUTTER

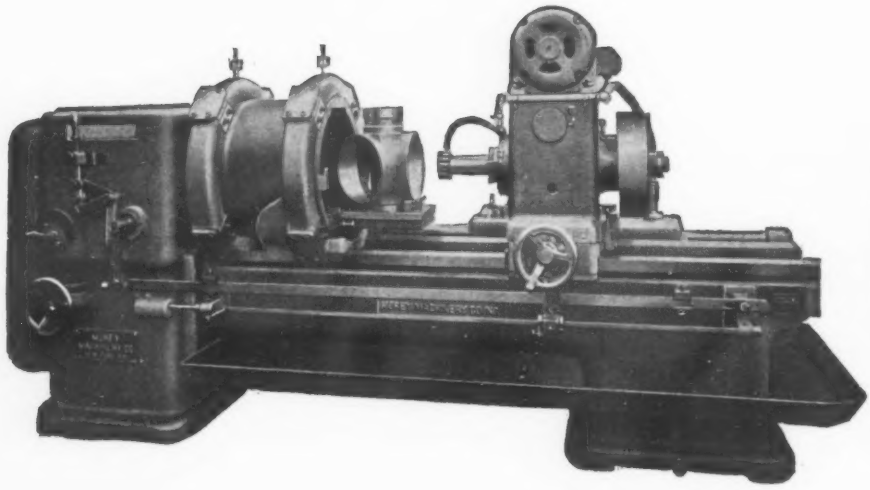
Note simple and effective clamp used on Ex-Cell-O Face Milling Cutter. Each clamp locks two blades quickly and securely.

By a twist of an ALLEN Hex Key, two blades of the cutter are unclamped at one time. A slight tap then unseats the tapered blade for adjustment, without removal from cutter. The Allen Socket Head Cap Screw holds blades rigid without wedges and with no threaded holes in cutter body to strip or become plugged. . . The locking clamp but typifies the time- and tool-conserving features so ruggedly built into Continental Face Milling Cutters, — products of EX-CELL-O CORPORATION, Detroit, Michigan.

The Allen Mfg. Company ★ ALLEN ★ Hartford, Conn., U. S. A.

MOREY DESIGNED AND BUILT *For* PRECISION *Plus* PRODUCTION

MOREY-SHIELDS THREAD MILLING MACHINE



Maximum diameter	Distance between centers
12″	60″
12″	90″
12″	120″

Longer beds to order

• Hole through spindle 4 1/16″ . . . Headstock—a complete self-contained unit . . . Simplicity in selecting varying cutter speeds and feeds . . . Extra heavy and rigid bed section...Motor driven cutter head, fully universal . . . Control—convenient to operator . . . Equally efficient for external or internal thread milling, with either single cutter or a hob.

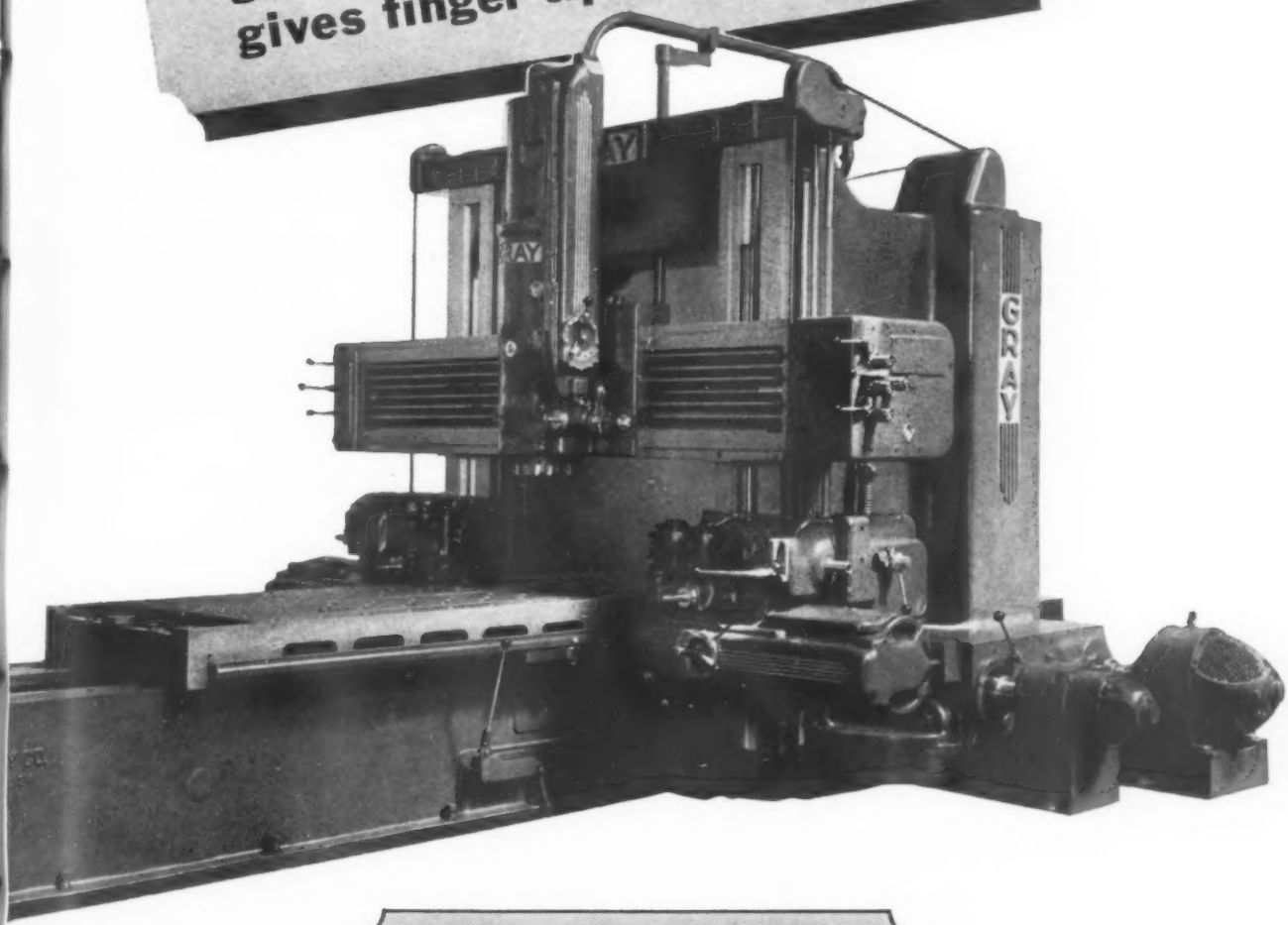
Ask for Circular No. 737

MOREY MACHINERY CO., INC
410 Broome Street New York, N. Y.

CONVENIENCE FLEXIBILITY RIGIDITY

characterize Gray Milling Machines. Balanced planetary gear drive of the unit heads gives finger tip speed control

ARMY E NAVY



GRAY

THE G. A. GRAY COMPANY
Cincinnati Ohio, U. S. A.

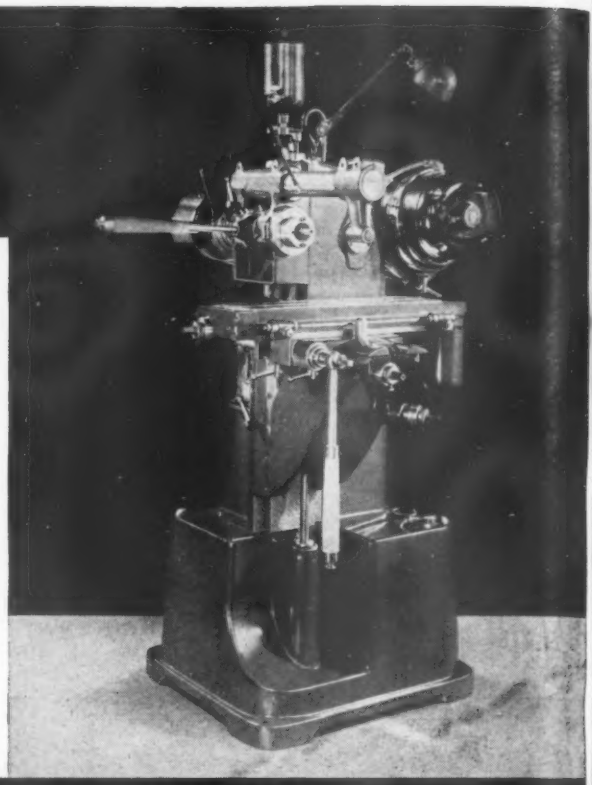
THE GRAY LINE — Double Housing and Openside Planers, Switch Planers, Die Block Planers, Double-Housing and Openside Milling Planers, Planer Type Milling Machines, Horizontal Boring Machines.

★ ★ STEP UP PARTS PRODUCTION AT LOW INVESTMENT COST

. . . with the

NICHOLS HAND MILLING MACHINE

Substantial savings in production milling are assured by the Nichols Hand Miller—a precision machine which combines the usual features of conventional hand millers with the ruggedness and in-built accuracy of modern high production machine tools.



OUTSTANDING FEATURES INCLUDE:

. . . one piece box section column with adequate slides for head and knee integrally cast

. . . heavy box section. Knee with extra long dovetail slides for both vertical adjustment and horizontal traverse

. . . table, fitted with oil pockets at ether end can be operated from either side of machine and locked in any position; standard equipment includes micrometer table stops; table feed screw optional.

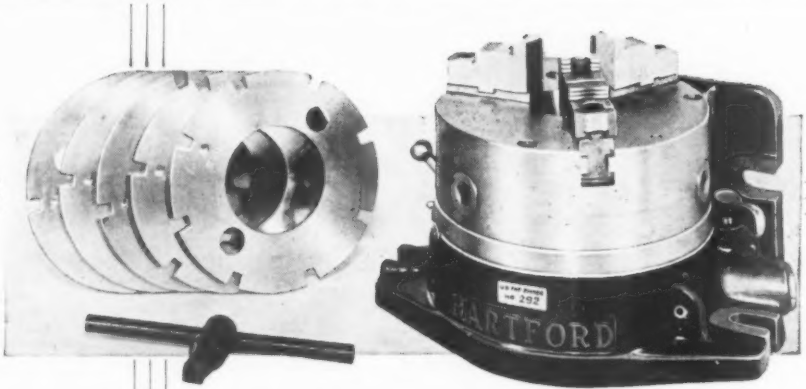
. . . hand operated vertical head fitted with hand set depth stop; can be locked in any position.

. . . spindle hardened and ground mounted on Timken Precision Roller Bearings

. . . capacity: longitudinal feed 10"; traverse feed 7".

» WRITE FOR COMPLETE DETAILED SPECIFICATIONS «

W. H. NICHOLS & SONS *Waltham, Mass., U.S.A.*



The
HARTFORD SUPER-SPACER
Simplifies
and
Speeds up
INDEXING

Applicable to

MILLING, DRILLING, SLOTTING, PLANING, JIG BORING and GRINDING OPERATIONS

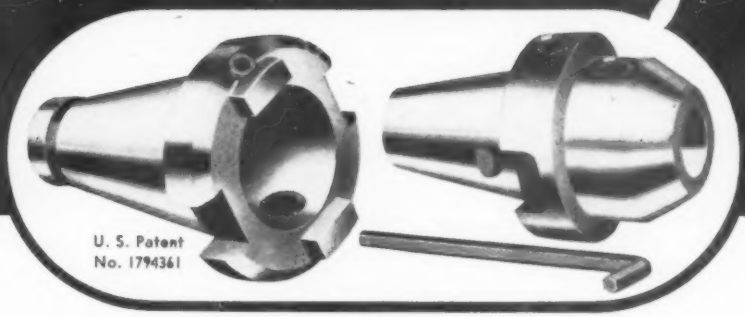
The HARTFORD SUPER-SPACER has won universal acceptance as a sturdy, accurate holding device for single piece work as well as quantity production. It provides practical, simple and foolproof means for saving time on indexing work and can be depended on to hold work securely even under heavy feeds and fast speeds. No special skill is required to use the SUPER-SPACER and attain accurate results because mask plates eliminate all chance of error in indexing.

This device offers many opportunities for rapid, accurate indexing because it can be used in either a horizontal or vertical position—a feature which definitely extends its utility.

WRITE FOR COMPLETE INFORMATION and DATA ON TYPICAL APPLICATIONS

THE HARTFORD SPECIAL MACHINERY COMPANY
HARTFORD CONNECTICUT

WELDON *Quick Change* ADAPTER *and* HOLDERS

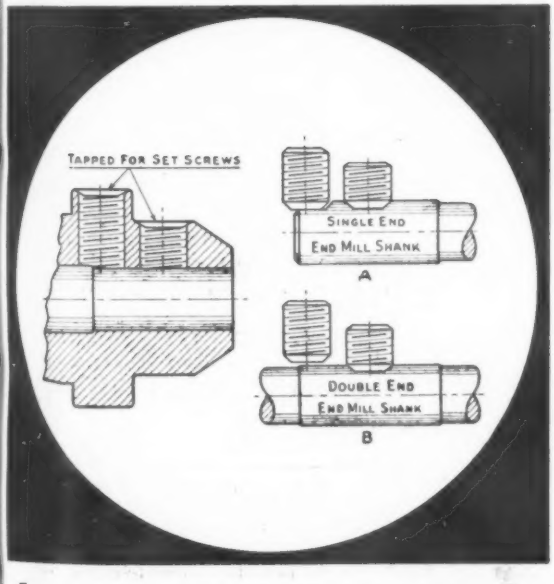


FOR USE IN MILLING MACHINE SPINDLES HAVING M.M. STANDARD NO. 50 TAPER

● The use of a Weldon Quick Change Adapter in a milling machine spindle permits the use of several different sizes of Holders and enables the operator to change from one size Holder to another—quickly and without loosening the spindle draw-bar each time a Holder is changed. For example: in a milling machine having a spindle with M.M. St'd. No. 50 Taper, ONE Adapter will take various Holders accommodating in turn End Mills having shank diameters of $\frac{3}{8}$"—$\frac{1}{2}$"—$\frac{5}{8}$"—$\frac{3}{4}$"—$\frac{7}{8}$"—1" and $1\frac{1}{4}$".

● The drive is simple and positive. The Adapter is held in the spindle by a draw-bar and is driven by keys on the spindle nose. The Holder is firmly held in the Adapter by two hollow head set-screws seating in angular pockets on the Holder shank. The actual driving power to the holder is thru the two solid keys on the Adapter nose which engage keyways on the Holder flange.

● SPEED UP YOUR PRODUCTION! SAVE TIME AND REDUCE COSTS WITH THE WELDON QUICK CHANGE ADAPTER AND HOLDERS!



For a firm, POSITIVE End Mill Drive specify WELDON 2-SCREW DRIVE HOLDERS

For positive end mill drive . . .

WELDON 2-SCREW DRIVE HOLDER

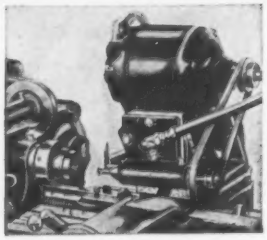
● The 2-Screw Drive Holder was developed by the WELDON TOOL CO. to provide a positive drive for the larger sizes of End Mills. It is of particular advantage with single-end End Mills as the two screws, properly seated, assure a firm, positive drive. Note in diagram "A" that the screw nearest the nose of the holder fits into and seats on the flat nearest the middle of the End Mill shank. The second screw seats on the flat at the end of the shank.

● The 2-Screw Drive Holder may be used for both single and double-end End Mills by releasing the set-screw farthest from the nose of the Holder enough to allow a double-end End Mill to be inserted. The Second screw need not be tightened when using double-end End Mills. See diagram "B". The 2-Screw Drive is furnished on all Weldon Holders $\frac{7}{8}$" and larger.

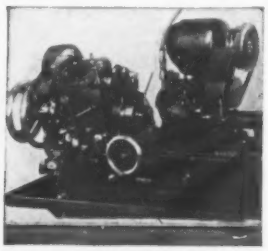
THE WELDON TOOL CO. *Cleveland, Ohio*

WALTHAM THREAD MILLERS

put precision thread milling on a production basis



Waltham Thread Miller equipped with Internal Threading Attachment.

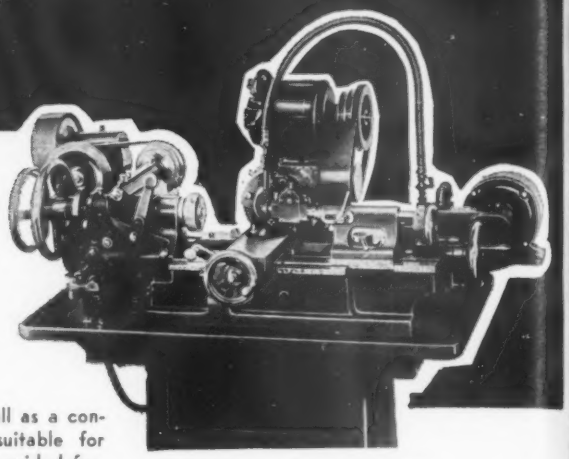


Machine equipped with Relieving Attachment.

These improved machines are fast, accurate and versatile. They will mill all standard forms of threads quickly, conveniently and accurately, cutters for which are available from Waltham.

Standard design includes three motors (one each for speed, feed and oil), a feature which permits individual speed change and reverse for both cutter and the work as well as a constant speed for the pump. Speeds suitable for either brass or steel or both are easily provided for. All motors are controlled from one convenient station.

Extra equipment available includes: plain and compound taper attachments, translating gears for cutting metric leads, metric lead screw, relieving attachment, special heads for internal and multiple cutter threading, and automatic cam operation, special equipment for cutting long lead.



SPECIFICATIONS

Swing over carriage 3"
Capacity (Diameter of work) 2" or smaller
Thread length (work held on centers) 8¼"
Thread length (work held in spring chuck at one end) 10"
Diam. hole through spring chuck ⅝"
Dia. hole through work spindle ¾"
Floor Space 48" x 34"
Motors: 1/3-1/4 and 1/6 HP

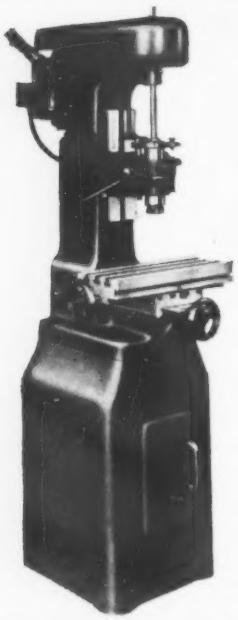
SEND FOR DESCRIPTIVE LITERATURE GIVING COMPLETE DETAILS.

WALTHAM MACHINE WORKS WALTHAM MASS.

WALTHAM TRADE MARK REGISTERED U.S. PAT. OFF.

THIS LITTLE JACK RABBIT FREES YOUR BULL DOGS

FOR HEAVIER WORK



• Don't waste hours and power by scheduling small, light jobs on heavy, slow machinery.

LINLEY high speed vertical MILLING AND JIG BORING MACHINES are demons at performing the many small part operations every tool room requires . . . at high speeds and to close tolerances.

With eight spindle speeds, direct reading micrometer depth gauge, which eliminates pencil figuring errors, and minimum floor space requirements, the Linley can be your machining profit leader.

For economic die work and model making, for jigs, metal patterns, drilling, milling and reaming it's hard to beat the Linley. Write for bulletin to Linley Bros. Co., 664 State St. Ext., Bridgeport, Conn.

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sizes 12" to 32" stroke

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Giant KEYSEATERS

MITTS & MERRILL
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SWISS TYPE

GEAR HOBBERS

. . . for accuracy and speed in hobbing pinions, gears and sectors.

TWO MODELS

No. 00 SPUR GEAR HOBBER (Illustrated) for work up to 2" dia.

No. 1 SPUR and SPIRAL GEAR HOBBER for work up to 6" dia.

Write for further details to

TRIPLEX MACHINE TOOL CORP.
Exclusive Sales Agents
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HAMILTON TOOL CO., *Builders*
Hamilton, O.

"Wouldn't Trade These Index Mills for Any Type of Miller"

Picture shows part of a battery of fifteen machines on gun parts in a Detroit plant. Insert circle shows one of the parts #46-40 prehardened steel Brinnill 300, and chips incidental to the work.

hen a certain general manager ade that remark, he voiced the feelgs of hundreds!

his general manager already had ozens of old line mills in his plant but uldn't get delivery on standard mill-. He had a flock of war orders to t out, and so he bought a battery Index Mills.

w he wouldn't trade them for any e of mill because of their flexibility d the unbelievable variety of work se Index Mills turn out.

dex Mills were originally designed for tool die and experimental work. Being equipped with verniers for locating and having available speeds fast enough for small end mills and rigidity for hogging out big chips on production work three shifts a day, they are becoming the popular machine on war parts as fast as managers get to know them. A piece of tool steel 8 x 16 can be worked with end mills ⅛ to ⅝.

If you haven't the facts on these unusual mills, manufactured by Index Machine & Tool Company, write today to the sales and distributing agents.

Blank and Buxton

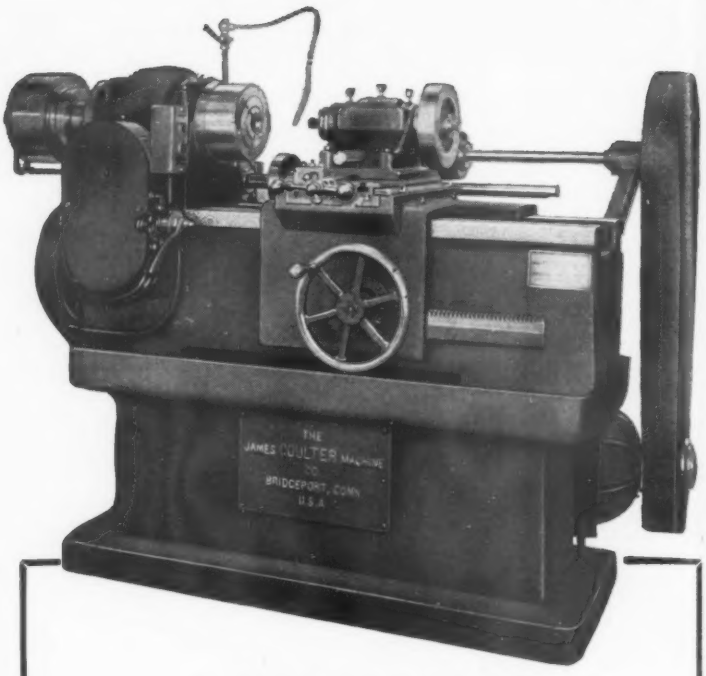
MACHINERY COMPANY - 2100 MICHIGAN AVE. JACKSON, MICHIGAN

Keep Ahead of
DEFENSE DEMANDS
on the PRODUCTION of
EXTERNAL and INTERNAL
THREADS

The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7″; minimum hole depends on smallest hob practical.



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BRIDGEPORT • CONNECTICUT • U.S.A.

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Piece-Part Control speeds up tapping operation — provides amazing control over accuracy of work.

The part and the machine do the "thinking." Air does the work! Operator has only to feed parts. With both hands free —with no need to use the foot pedal—operator can turn out more work—faster and better—than by any other method. Full details in TAPPING TIPS—new literature devoted largely to critical war work. Write for a copy. R. G. Haskins Company, 2761 W. Flournoy St., Chicago.

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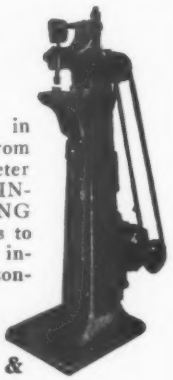
HASKINS *Precision* TAPPING EQUIPMENT



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Write for literature and don't forget to send samples.

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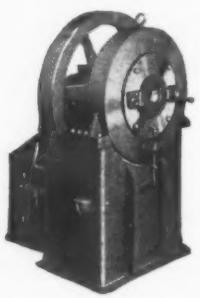
85 Silliman Ave., Bridgeport, Conn., U. S. A.



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ROTARY
SWAGING MACHINE

— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

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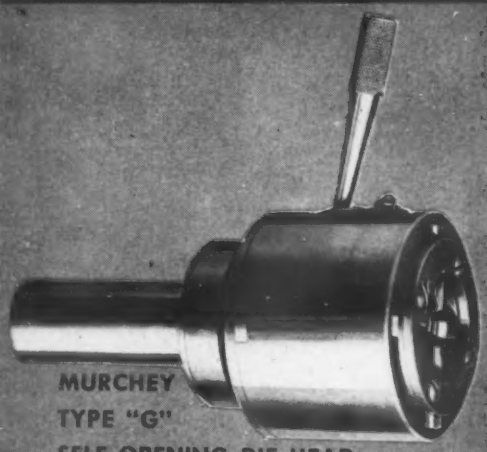
Delivery-FOUR WEEKS



MURCHEY
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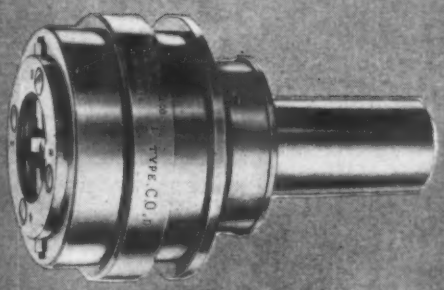
SELF-OPENING DIE HEAD
(NON-ROTATING)



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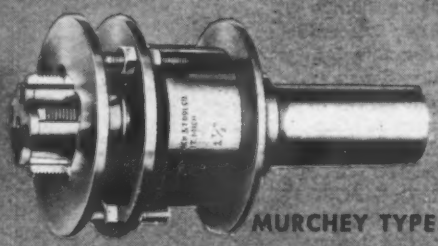

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Efficient and prompt telephone service is available making it possible to give immediate attention to your requirements at all times.

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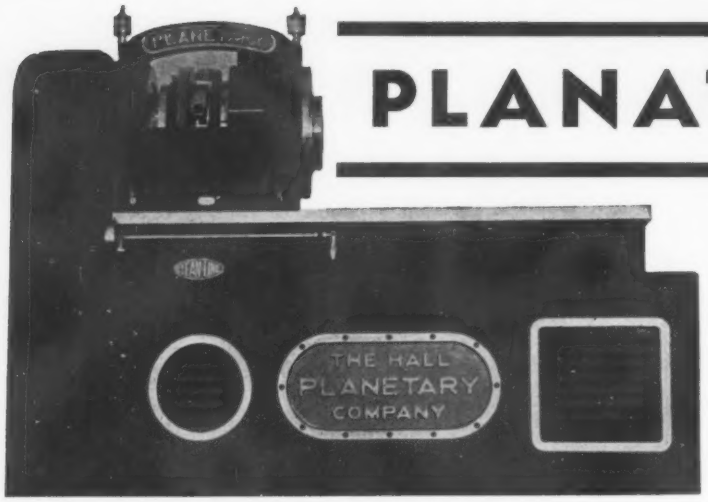

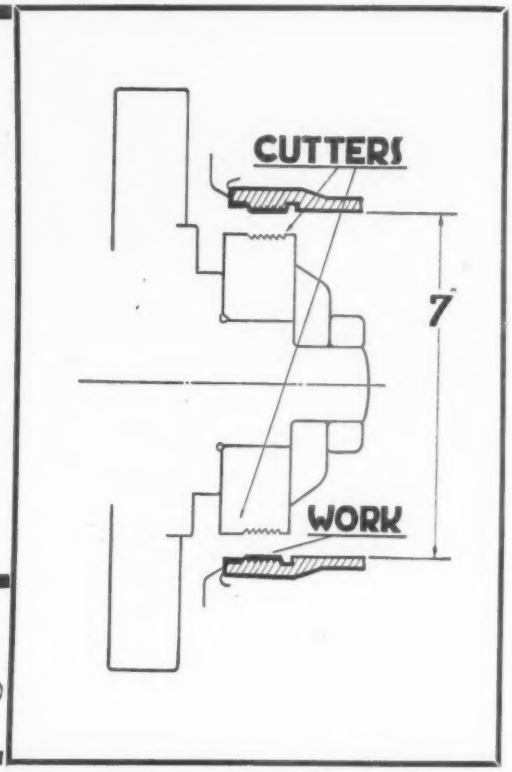

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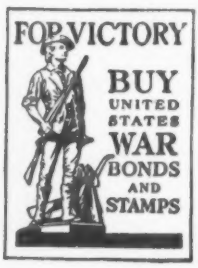

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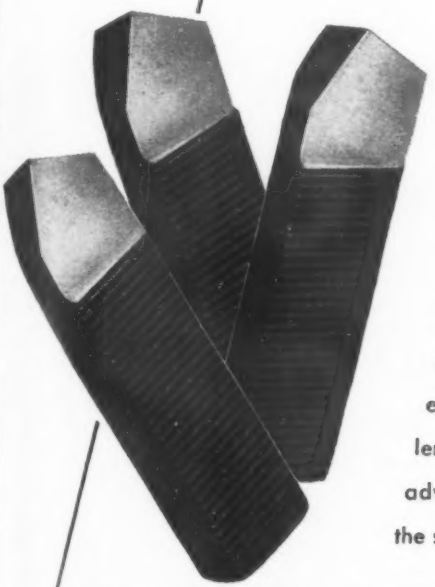
If early delivery of fine milling cutters and blades is important to you . . . .

LOVEJOY CUTTERS

Our customers, during this war period, have felt that Lovejoy Milling Cutters were worth waiting for. Now we are pleased to announce that because of greatly increased production facilities, *all standard Type "A" Lovejoy Cutters with High Speed Steel Blades are now available on two weeks delivery.* Other standard and special cutters may take a bit longer, but Lovejoy will be pleased to give a prompt delivery promise that will be held — just as we have always done for the past 26 years.



LOVEJOY BLADES

Standard Lovejoy Positive-locking Blades, for Type "A" Cutters, are available for immediate shipment out of stock. *Standard Type "A" blades stocked for immediate shipment include High Speed Steel, Cemented-Carbide, Stellite and Rexalloy.* Please, however, use your present blades to the limit (½ their length or more) before ordering new ones. Take advantage of this Lovejoy feature and help conserve the scarce supply of High Speed Steel.

LOVEJOY

TOOL COMPANY, INC.
Springfield, Vermont, U. S. A.

Please send me the 24-page Lovejoy catalog covering the full line of Lovejoy Milling Cutters and Blades.

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A.M.

56 Holes Drilled in 8 Seconds...

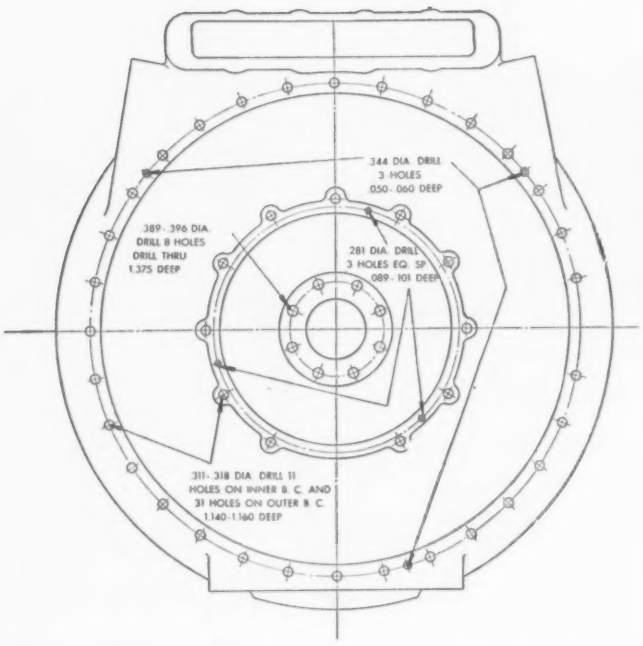
Supercharger Rear Housing

56 holes as per layout .. Magnesium 1408 feet per minute—1700 r. p. m.—.006" feed—10.2" penetration per minute.

Actual drilling time 8 seconds.

Loading and unloading time, either single hole or in multiples, dependent on jig design and human element factor.

HOEFER Multiple Drilling Heads Can Be Furnished for Most Needs



★ **Where holes can be worked in multiples for either drilling or allied operations Hoefer Multiple Spindle Heads offer a simplified method with time saving results.**

Hoefer Heads are attachable to your own drill presses or turret lathes—you save floor space as well as cost of new machinery.

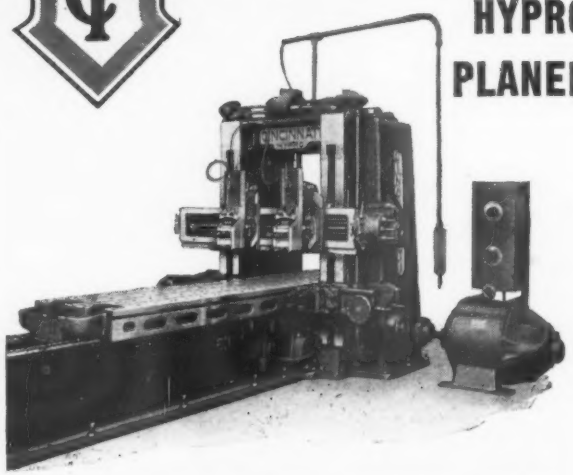
The Hoefer Head featured here is but one of thousands we have developed for specific needs. Your requirements can be as easily developed by our engineers. Write telling us about your job.

HOEFER'S WHOLE BUSINESS IS HOLES

HOEFER MFG. CO. *Freeport, Ill.*

CINCINNATI

HYPRO PLANERS



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Rigidity improves accuracy. Speed increases production.

Full line from 36" to and including 120" in double housing and openside.

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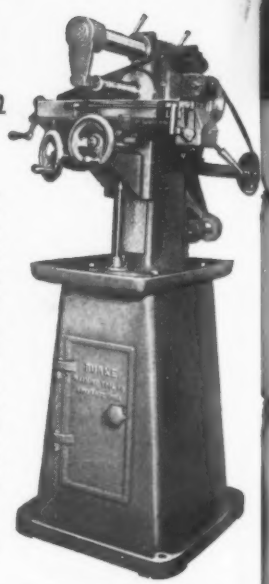
THE CINCINNATI PLANER CO.
CINCINNATI, OHIO

BURKE MILLING MACHINES

. . . Put Your Small Work on a Production Basis!



Those small, difficult jobs can be handled on a *production basis* with BURKE Motor Driven Milling Machines Nos. 1, 2, 3, & 4. Primarily, this is because BURKES have been *specially designed and built* to do smaller milling jobs efficiently and economically.

Then, too, a number of attachments are available . . . attachments that increase the units usability, and add to your productivity. These include a vertical milling attachment, index centers, and vises — 3 types, including swivel base. Now, when production must be stepped up, is the time to investigate the profit possibilities of BURKE Milling Machines, as applied to your work.

Complete Information Will Be Sent You Upon Request—Write!

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DO A "TWO-FISTED" MILLING JOB!

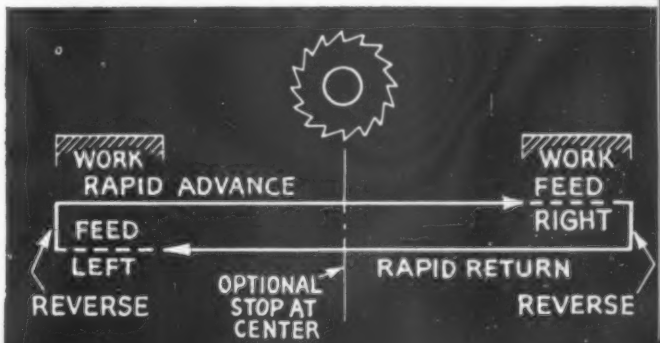
Here's how to *greatly increase production* on many jobs with a Kent-Owens No. 2-20 Milling Machine! You simply take advantage of the fact that this machine can do *one operation at one end of the table* and *another operation at the other end.*

The Kent-Owens is the only machine which has independent feed rate for both directions of table travel. This permits running one job at one end of the table and an *entirely different* job at the other end. Thus *one* machine does the work of *two!* Send for latest bulletins. Kent-Owens Machine Co., Toledo, Ohio.

Call on KENT-OWENS *for Milling Machines*

This example shows feed to left set at 10" per minute and that to right at 4" per minute. Or both feed rates can be exactly the same.

No. 2-20 Milling Machine has fully automatic cycle, and can be equipped with either one-way or two-way positive stop with dwell.



The Book of the YEAR!

VICTORY SCREW THREAD
DATA BOOK
With
Foreign and Domestic
THREAD SYSTEMS

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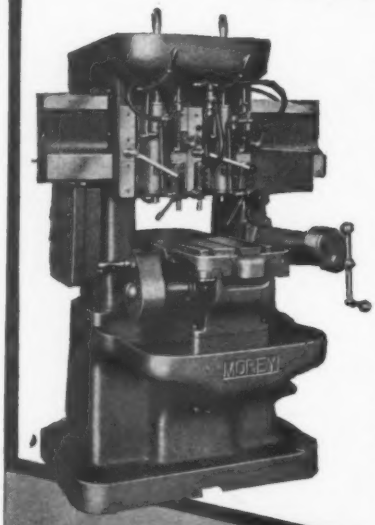

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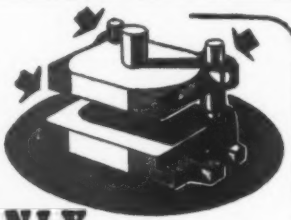

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THE REPORT: **"With regular grinding, 67 parts were machined before failure of the milling cutter. We then stoned the same cutter by hand with a 'Hard Arkansas.' This increased production to 280 parts. High speed production on this metal means that all cutters have to be hand stoned."**

The stone used was a "Hard Arkansas" square file $3\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}''$ costing 70¢, good for years of the same high grade service.

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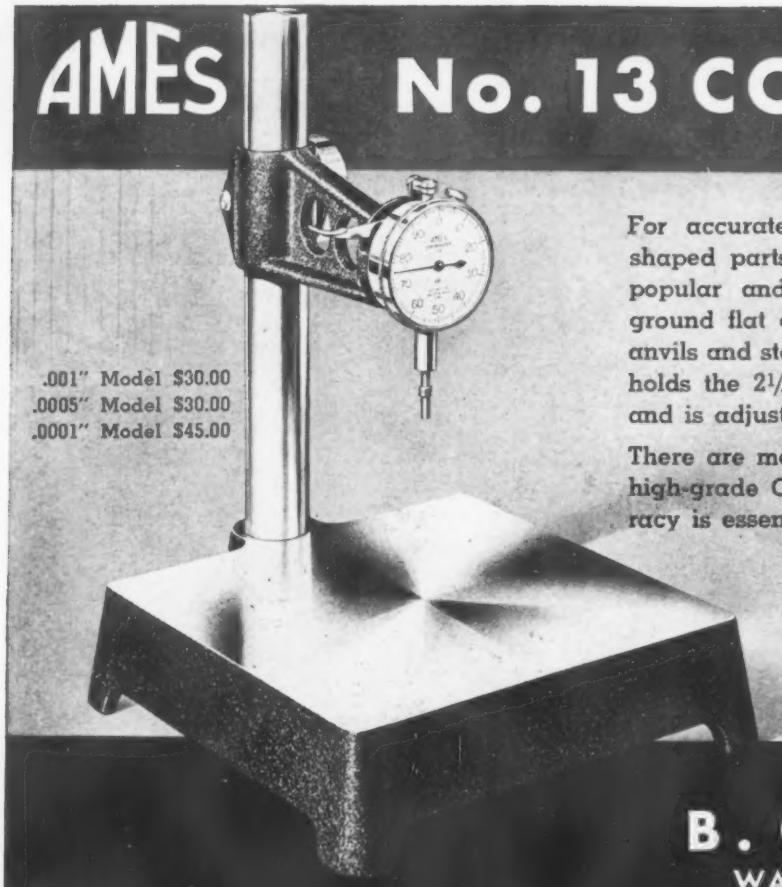

.001" Model $30.00
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.0001" Model $45.00

For accurately measuring large, small and odd shaped parts speedily, this No. 13 Comparator is popular and attractive. The 8" square base is ground flat on top and often fitted with V blocks, anvils and stops of various kinds. The bracket which holds the 2¼" indicator extends 4" over the base and is adjustable for measuring up to 6".

There are many uses for this inexpensive, durable, high-grade Comparator in every shop where accuracy is essential.

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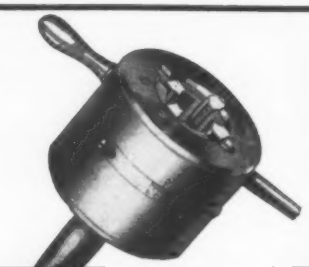
TURRET OR HAND SCREW MACHINES



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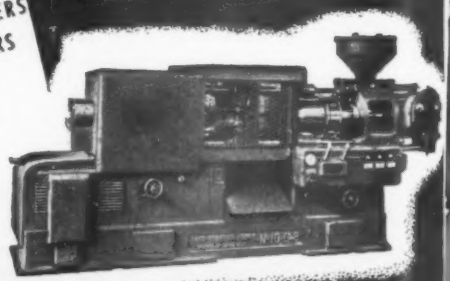

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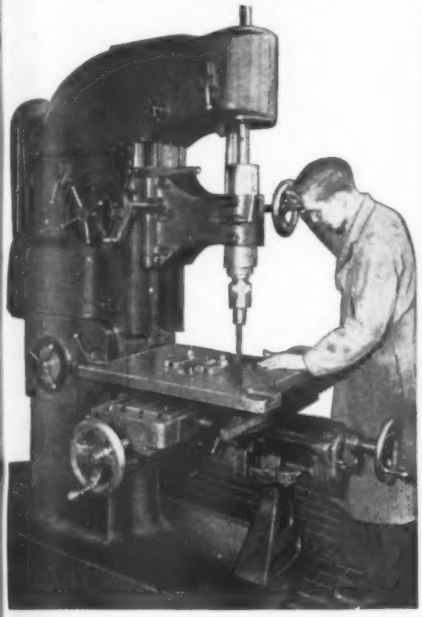
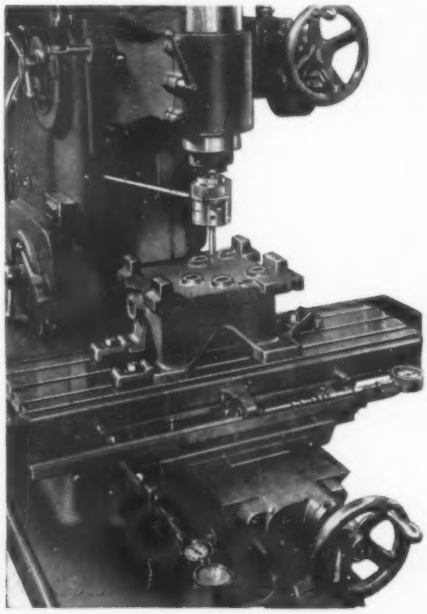
KNIGHT Millers have the necessary requirements for precision borings of jigs and fixtures . . .

DRILLING HOLES

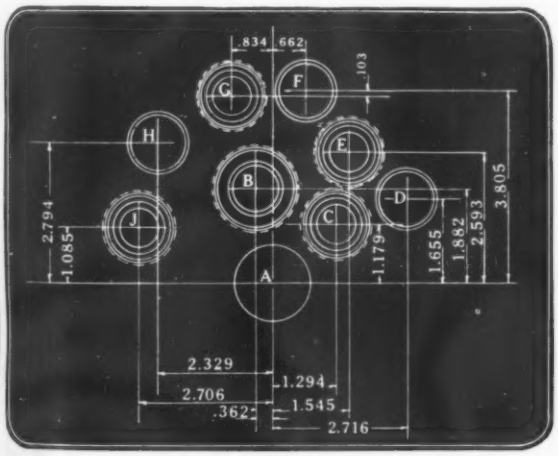


Holes are being drilled in a large die plate before the next step which is boring. Dial indicator is being used on longitudinal movement to locate holes quickly and accurately without preliminary layout.

BORING JOB



Here you see a typical boring job being done on a KNIGHT Miller. With dial indicators, all five holes were accurately located and bored. At the same setting the corner pads were milled, insuring squareness with the bored holes.



Time and Money SAVED

Here is an example of how you can save time and money with a KNIGHT Miller doing precision boring. Although most of the holes had several different diameters to be bored, they were all done in four and one half hours or thirty minutes to the hole from the solid piece. The spacing from one hole to the other was held to limits of plus or minus .0002".

KNIGHT Millers are not single purpose machines designed for precision boring only. Though they are so well adapted to and capable of handling precision boring, at the same time, they are equally well adapted to other types of machining operations without impairing the accuracy of the machine for jig boring. KNIGHT Millers are fast, compact, complete, and convenient to handle, with plenty of power and capacity to do the most exacting jobs you demand of milling machines.

Read about these features and others in catalog—

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A balanced unit that gives the maximum of service without sacrificing one quality for another.

- **RIGIDITY:**

Firmness that insures high standards of workmanship and production volume.

- **ACCURACY:**

The result of design as well as precision of workmanship and the quality of materials used.

- **VERSATILITY:**

Capabilities which greatly simplify many set-ups that would otherwise be difficult to obtain.

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From either a sitting or standing position, the operator always has a clear vision of the job—one set of simple, convenient directional controls, for both hand and power operation, within easy reach.

- **CAPACITY:**

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- **PRECISION BORING:**

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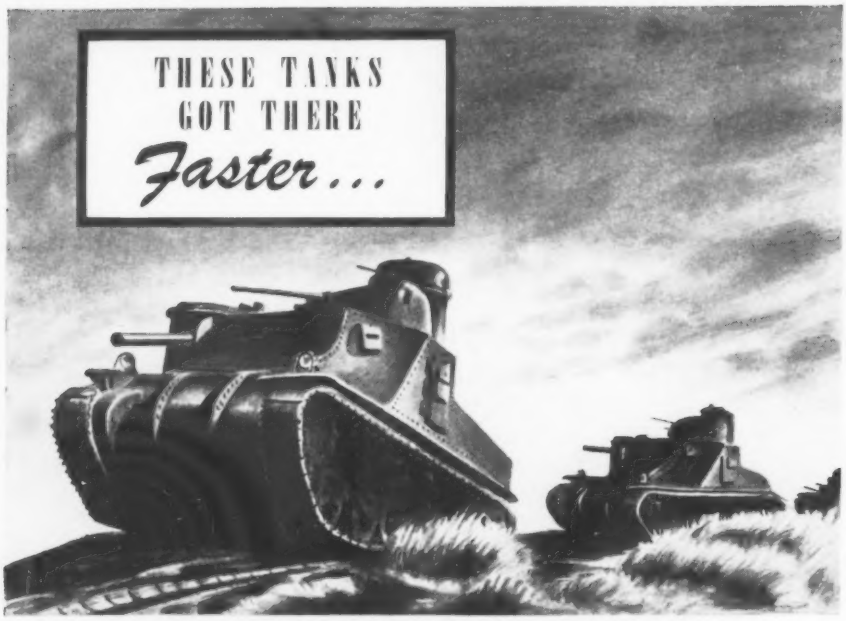

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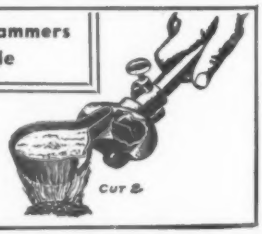

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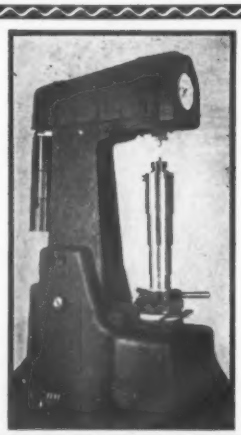

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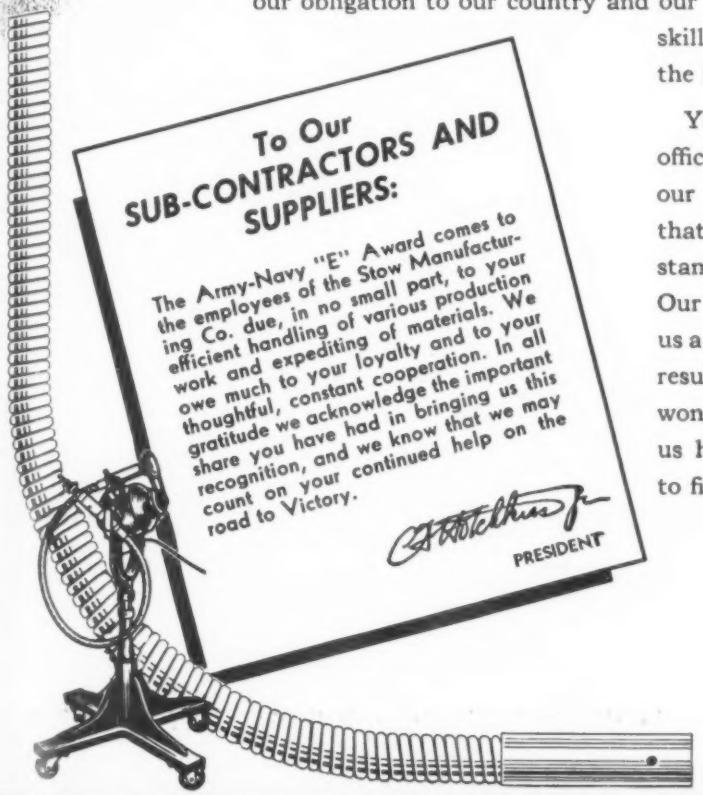
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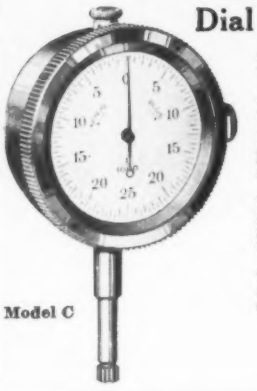

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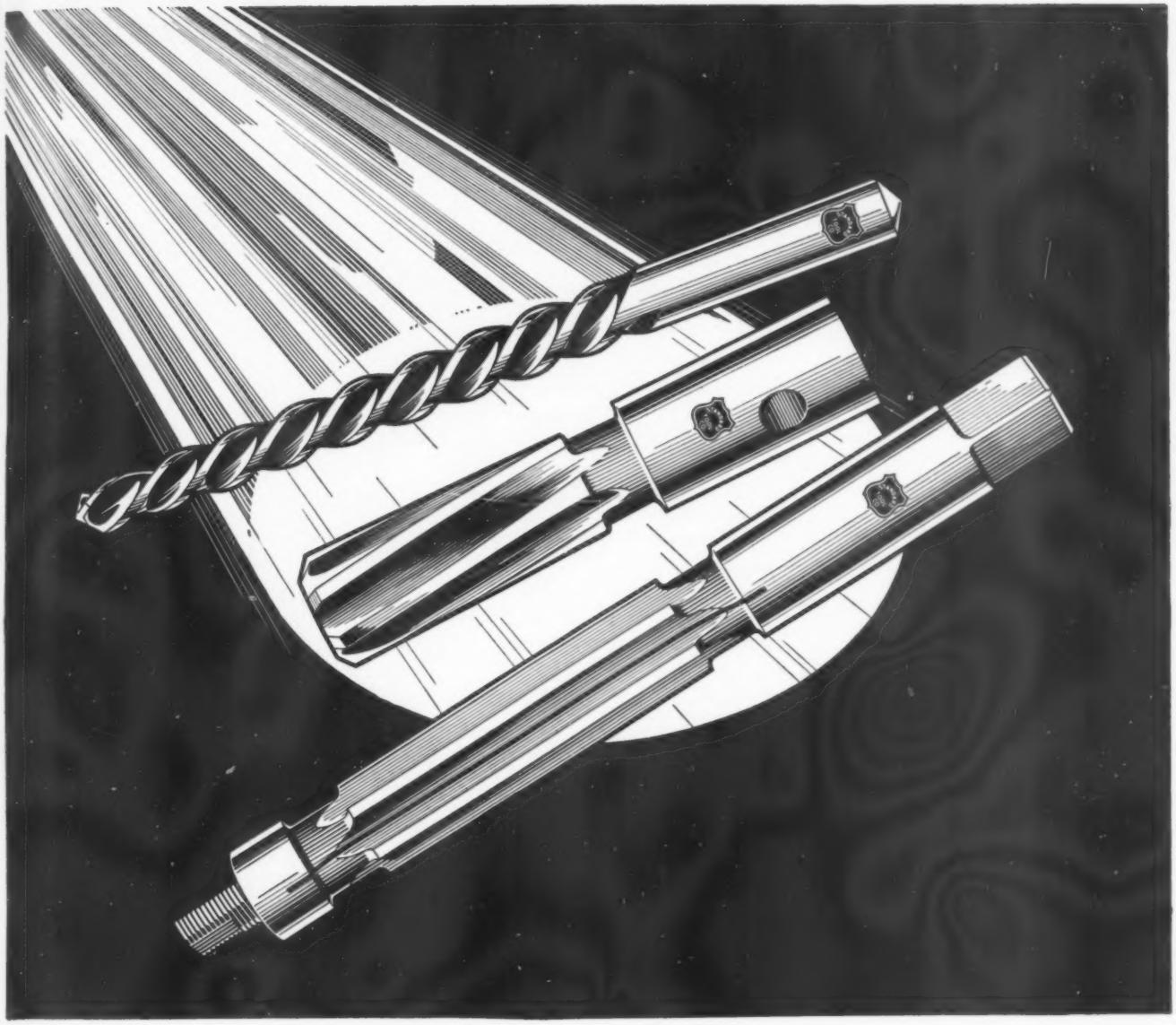

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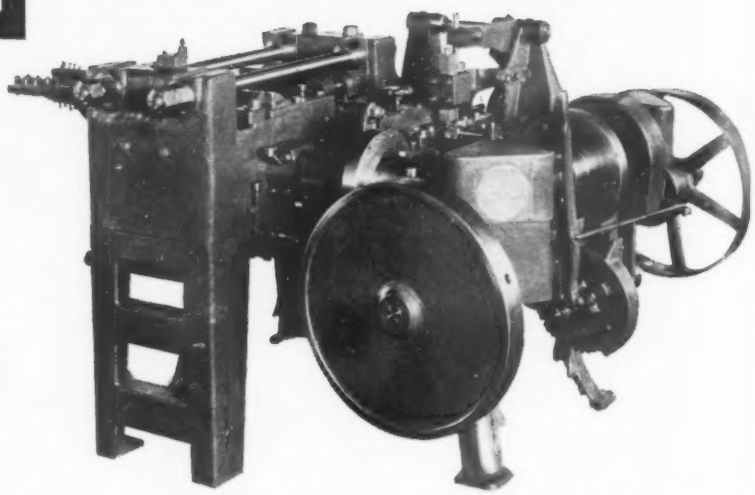

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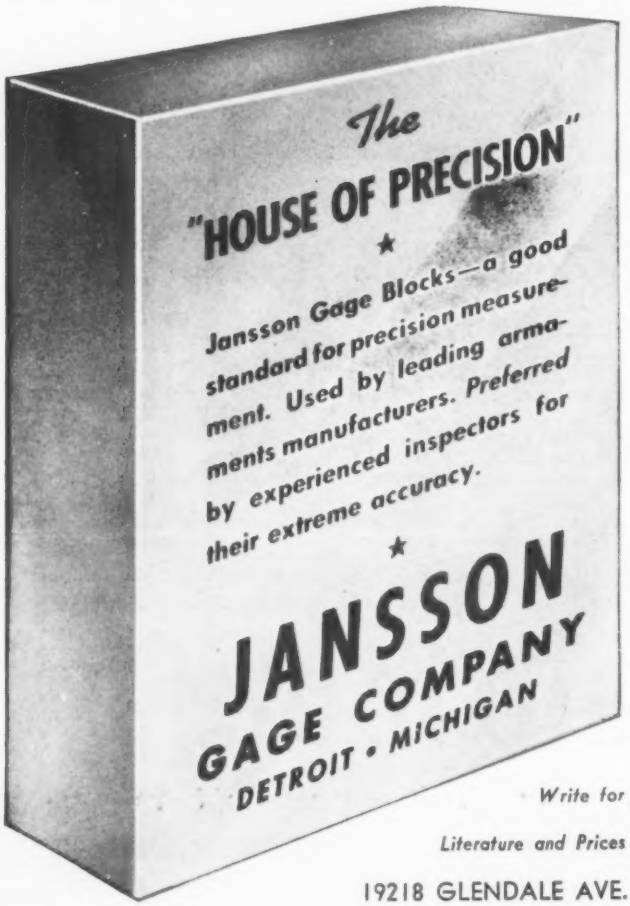
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Lempco won the "E" award for outstanding war production

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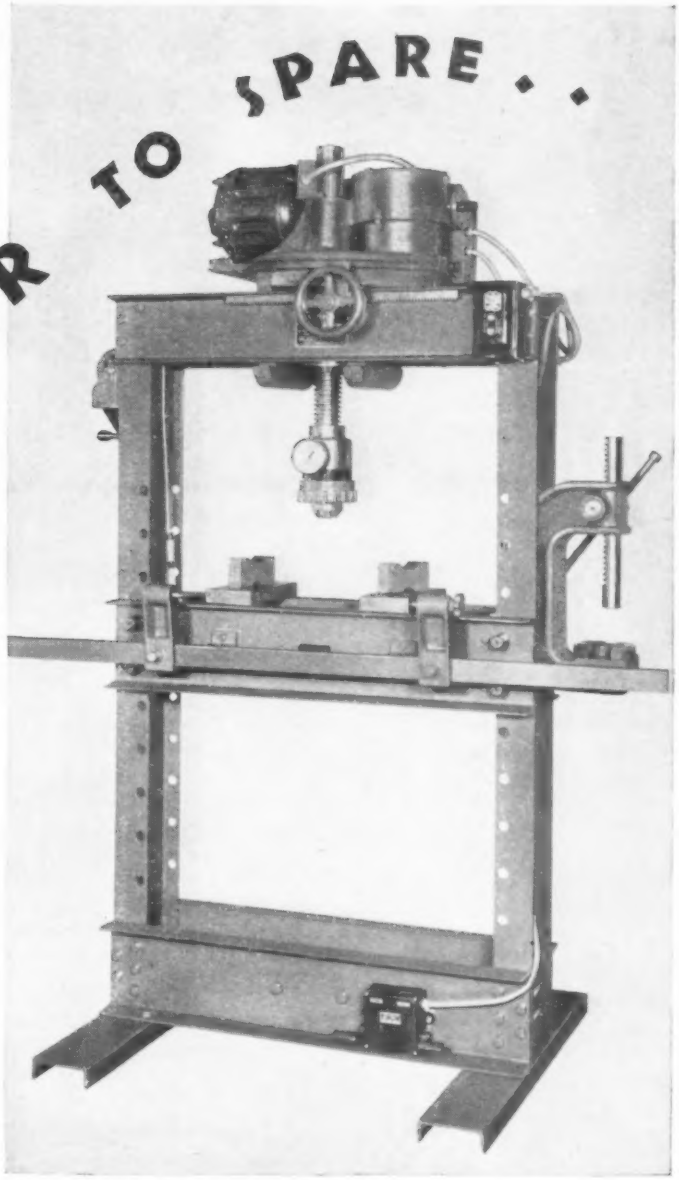


. . FOR THE POWER TO WIN IN THE PRESSUREMATIC

These are power presses to gladden the hearts of production foremen and sadden the souls of Axis henchmen. For they're pushing in press fits on tanks, forming dies for bullets, being used all over the United Nations in the great aircraft plants for straightening, bending, die try-outs, and assembling operations. Fast, too, from 0 to 60 tons in 4 seconds. They're *great* presses, mister, and we'd like to tell you more about them . . .

AUTOMATIC PRESSURE CONTROL GAUGES

Solenoid Controls stop, or back ram off work and make it come down again, at any pre-set pressure—automatically! Fool-proofs production runs! Ideal for inexperienced operators.

★ ***PROMPT DELIVERY***

★ ***ELECTRIC AND HYDRAULIC MODELS***

★ ***40 AND 60 TON CAPACITIES***

$215 TO $1398

WRITE FOR DETAILED SPECIFICATIONS

Prompt Delivery! Priorities Can Be Had—Write Us.

LEMPCO

PRODUCTS · INC.

BEDFORD · OHIO · U·S·A

ESTABLISHED 1919

SEE ONE WORK – MAIL THIS COUPON

LEMPCO PRODUCTS, INC., Dept. AM, Bedford, Ohio
GENTLEMEN: Tell me the plant or shop nearest my place of business where I may see a Lempco Press.

NAME .....

ADDRESS .....

CITY ..... **STATE**.....

DOUGLAS PRECISION SLOTTER

Swiveling ram head and tool holder, automatic circular table and independent automatic feeds in all directions.
7" TO 10" STROKE
DOUGLAS

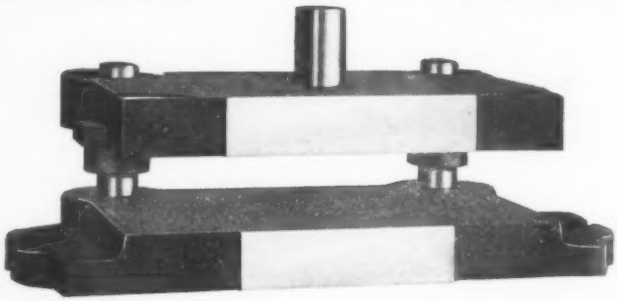
PROMPT DELIVERY

DOUGLAS MACHINERY CO. INC.
150 BROADWAY NEW YORK, N. Y.

DETROIT DIE SETS ★

STANDARD
DIE SETS and ACCESSORIES

SEMI-STEEL • ALL STEEL



PRECISION DIE SETS • SPECIAL DIE SETS • DOWEL PINS
SPRINGS • SOCKET-HEAD SET SCREWS • CAP SCREWS

STEEL BOLSTER, STRIPPER AND PRESSURE PLATES
Made to Order — Any Shape — Any Size

Write for Catalog

DETROIT DIE SET CORP.
2895 W. GRAND BLVD. DETROIT, MICH.

Get this Bulletin-

THE MOTCH & MERRYWEATHER
Triple-Chip METHOD
MARKS A NEW HIGH IN THE EFFICIENT COLD SAWING OF METAL AND Longer Blade Life!
THE MOTCH & MERRYWEATHER MACHINERY COMPANY
CLEVELAND, OHIO

ON THE MOTCH & MERRYWEATHER Triple-Chip METHOD OF COLD SAWING METAL

Ask for our new Bulletin "A"

Here's a lively new 8-page bulletin which shows how to cold-saw metal faster, more accurately and more economically than you have probably ever done it before. Plenty of pictures—blade features galore—developed by the *only* manufacturer building "all 3:" the *blade itself*, the *saw that uses it* and the *machine that sharpens it.*

THE MOTCH & MERRYWEATHER MACHINERY COMPANY
Penton Building • Cleveland, Ohio

Built by **MOTCH & MERRYWEATHER** — Motch and Merryweather Machinery Co. — Cleveland, Cincinnati, Detroit, Pittsburgh

HARDNESS TESTER

Let the SCLEROSCOPE speed up the production of that s so we can blow the Axis to **HELL**

Write for Circular!

THE SHORE INSTRUMENT & MANUFACTURING CO., INC.
9025 VAN WYCK AVENUE
JAMAICA, NEW YORK
TELEPHONE: JAMAICA 6-4090

ATOMETRIC GAGE BLOCKS

ACCURACY

PERFECTION IN MEASUREMENT
MEANS
PERFECTION IN YOUR PRODUCT

ATOMETRIC PRECISION GAGE LABORATORIES, Inc.
STAMFORD, CONNECTICUT, U. S. A.

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE:
10 cents a word, minimum charge $2.00. (See ¶ on Box Numbers.)
POSITIONS WANTED (full or part-time individual salaried employment only), ½ above rates.
PROPOSALS. 50 cents a line an insertion.

INFORMATION:
BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.
DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH
The advertising rate is $6.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns — 30 inches—to a page. A.M.

NEW ADVERTISEMENTS received by 10 A.M., April 5th will appear in the issue of April 15th subject to limitations of space available

WANTED

TOOL ROOM FOREMAN

Who can earn $6500.00 per year to take charge of tool room in a western Michigan concern. The man we will hire for this job must be able to get work out as scheduled in accordance with prints and specifications and at a minimum cost.

The man we are looking for must have the responsibilities of foremanship.

If you are looking for a job on salary to retire do not apply.

P-551, American Machinist
330 W. 42nd St., New York, N. Y.

MACHINE SHOP FOREMAN

Must Have A1 Experience

Must be able to set up milling machines, lathes, screw machines, plan and lay out work and estimate costs. This includes directing and supervising several hundred men.

STEADY WORK
$7,500 YEAR
Location—Manhattan

ONLY U. S. CITIZENS
not engaged at full skill in war work

WRITE, GIVING ALL DETAILS
Box 191, EQUITY, 113 W. 42 St., N.Y.C.

REPRESENTATIVES WANTED

FOR ALL PRINCIPAL CITIES OF THE UNITED STATES

To handle a new revolutionary head stock center for lathes and grinders, also tail stock centers and center point lubricants. Repeat Business.

Please write giving complete qualifications in first letter.

RW-549, American Machinist
520 N. Michigan Ave., Chicago, Ill.

SELLING OPPORTUNITIES

OFFERED—WANTED

Selling Agencies—Sales Executives
Salesmen—Additional Lines

POSITIONS VACANT

These Positions Vacant advertisements are published subject to agreement by the advertisers not to consider applicants now employed on war work unless they obtain written release from present employer.

MECHANICAL DRAFTSMAN capable of designing and developing Power Industrial Truck Equipment. Permanent position with opportunity for advancement. Must be over 38 years of age and able to take charge of drawing room. P-546, American Machinist, 330 W. 42nd St., New York, N. Y.

TIME STUDY EXPERT. One with years of experience in placing time studies for piece work on all operations of milling cutters, form cutters, end mills, reamers, etc. Both on High Speed Steel and Carbide Tipped. An organization in Detroit of 160 employees will pay an extra good salary and assure a permanent job to a man who can qualify. Give last ten years experience and present employer. References in first letter, also salary desired. Everything will be kept strictly confidential. P-552, American Machinist, 330 W. 42nd St., New York, N. Y.

WANTED—By Leading Machine Tool Builder man for advertising department. Please furnish full particulars regarding your experience together with salary expected. P-553, American Machinist, 330 W. 42nd St., New York, N. Y.

EMPLOYMENT SERVICE

SALARIED POSITIONS — $2,500 to $25,000. This advertising service of 33 years recognized standing negotiates for positions of calibre indicated. Procedure individualized to your personal requirements. Retaining fee protected by refund provision. Identity covered. If salary has been $2,500 or more send for details. R. W. Bixby, Inc., 266 Delward Bldg., Buffalo, N. Y.

POSITIONS WANTED

EXECUTIVE ENGINEER—open for connection to develop products, processes, and tooling for present and post-war products. Accustomed to originating designs and carrying into production including development of special production-machines, plant design and organization. Contribute valuable inventions on royalty basis. Salary $12,000 or percentage of savings. Age 40. PW-540, American Machinist, 520 N. Michigan Ave., Chicago, Ill.

Executives, Engineers, Chemists and Metallurgists!

Qualified men wanted for openings throughout the United States. Write for application, or submit experience record.
Inquiries solicited from responsible employers.
All negotiations confidential. Est. 28 yrs.

HARRISON PERSONNEL SERVICE
20 W. Jackson Blvd. CHICAGO

POSITIONS WANTED

MECHANICAL EXECUTIVE with 30 years experience as Works Manager and Superintendent. Well versed on modern methods. A1 references, available March 15. PW-538, American Machinist, 330 W. 42nd St., New York, N. Y.

WORKS MANAGER, or General Superintendent. Thirty years of practical experience in metal manufacturing, including: Five years as tool supervisor of large typewriter company. Fifteen years superintendent of manufacturing automotive and airplane electrical equipment. Thoroughly familiar with all phases of modern manufacturing methods. Excellent record. Age 50 years. American born. Salary $12,000. PW-554, American Machinist, 330 W. 42nd St., New York, N. Y.

AUTOMATIC SCREW MACHINE FOREMAN, desires connection with established company. Thirty-five years experience Brown & Sharpe, Davenport, Acme, Gridley, and Cone machines. Capable estimating, laying out cams, and designing tools. Thoroughly grounded in all phases of modern practice. Successful record twenty-five years in charge of modern and up-to-date Automatic Screw Machine Departments, good co-ordinator organizer and maintainer of labor relationships with getting results. Experience in training programs male & female. Prime & Sub-Contracting Estimating. Thorough mechanic tool making training. Aggressive and capable of rendering real assistance to over worked executive. Very good reason for making change. Location immaterial. Available at once. PW-555, American Machinist, 330 W. 42nd St., New York, N. Y.

EXECUTIVE—technical graduate. Thirty-five years experience in product design, tools, production and sales. Can provide designs for volume product for post war business. Soon at liberty. PW-556, American Machinist, 520 N. Michigan Ave., Chicago, Ill.

OPPORTUNITY OFFERED

MECHANICAL ENGINEER for a manufacturer of precision gears. Must have long selling experience in the same line. Write full details outlining educational background, names and addresses of former employers, territory covered. Exceptional opportunity for well qualified man. SW-539, American Machinist, 330 W. 42nd St., New York, N. Y.

PATENT ATTORNEYS

PATENTS, COPYRIGHTS. Booklet, "General Information Concerning Inventions and Patents" and "Fee Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 453, 815-15th St., N.W., Washington, D. C.

CONTRACT WORK

WORK WANTED — For advertisements of work wanted see page 264.

THE NICHOLS TABLE OF SCREW THREADS AND TAP DRILLS
$1.75
Now is the time to order your copy. One table, 60 PAGES long, listing all standard screw threads with essential thread data.
THE NICHOLS CO. 1313-K ST. S.W., CEDAR RAPIDS, IOWA

Professional Services

BRIGGS-EVANS
Engineering Consultants
Specialists in Design & Methods
High Production
Dies, Tools, Jigs, Special Machines
We know how best to do
what you would like to do
60 STATE ST., BOSTON, MASS.

AUCTION ADVERTISING: See Page 272 • WANTED ADVERTISING: See Page 274

CONTRACT WORK

ESSEX
MACHINE WORKS
ESSEX, CONN.

•

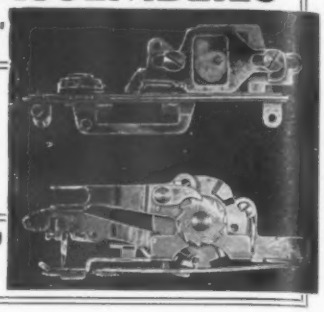
Contract Manufacturing and Industrial Machine Work

•

Producing For War
Planning For Peace

STAMPINGS AND ASSEMBLIES

"GREATER SAVINGS WITH GREIST"



We can make short or long runs in any metal. Our modern equipment and methods, backed by 50 years of experience, are your guarantee of satisfaction. We are also fully equipped to make

SCREW MACHINE PRODUCTS
TOOLS, DIES, JIGS, FIXTURES

Quality work by skilled mechanics is assured. Send your blueprints or samples today!

THE GREIST MFG. CO.
546 BLAKE ST. NEW HAVEN, CONN.

CONTRACT WORK—

We can build machines and parts, special tools and fixtures of all kinds to your specifications and design. Skilled workmen and modern equipment are your guarantee of satisfaction. The design and building of wire and ribbon stock forming machines are our specialty.

We solicit your blueprints or samples for quotation. No obligation of course.

THE A. H. NILSON MACHINE COMPANY
Bridgeport, Conn.

METAL STAMPINGS
• *TOOLS* • *DIES* •
PERMANENT MAGNETS
HEAT TREATING
THOMAS & SKINNER
STEEL PRODUCTS CO.
1103 E. 23rd St. INDIANAPOLIS, IND.

DESIGN & BUILD
JIGS, FIXTURES & GAGES
REED MACHINE & TOOL ENG.
BOX 662
PAWTUCKET, R. I.

WIRE AND METAL SPECIALTIES
In round, flat, square and special shaped wire in all metals.
LARGE PRODUCTION CAPACITY
Plating and finishing.
EASTERN TOOL & MFG. CO.
BLOOMFIELD, N. J.

SUB-CONTRACT FACILITIES FOR

Hand screw machine products.
Engine and bench lathe, milling the drill press work.
Small sheet metal fabrications to closer than commercial tolerances.
Stampings.

We do our own tooling

RELIANCE MACHINE & MFG. CO.
Thirty Irving Place New York City
36 years experience in metal fabrication

PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us – we will take care of them.
GENERAL PATTERN WORKS
2233 Buck Street Cincinnati, Ohio

COMMERCIAL HEAT TREATING
Seasoning of Steel, Nitriding
Centerless, Broach, Thread Grinding
Magnaflux & Optical Testing
Metallurgical & Chemical Laboratories
Cadmium & Hard Chrome Plating
AGERSTRAND CORPORATION
Muskegon, Michigan

DOES IT WORK?

Is the Contract Work Section helping *American Machinist's* subscribers and readers find outside help when they need it? Does advertising in this section really do its job?

If you have idle equipment to put to work, you will want the answers to these questions. You can get them quickly by addressing CONTRACT WORK DEPARTMENT, *American Machinist*, 330 West 42d St., New York, N. Y.

KIRK & BLUM
CONTRACT MANUFACTURING
ACCURATE SHEET STEEL
STAINLESS STEEL, MONEL OR
OTHER ALLOY FABRICATION
OUR SPECIALTY
CAPACITY 3/8" AND LIGHTER
THE KIRK & BLUM MFG. CO.
2823 SPRING GROVE AVE. CINCINNATI, OHIO

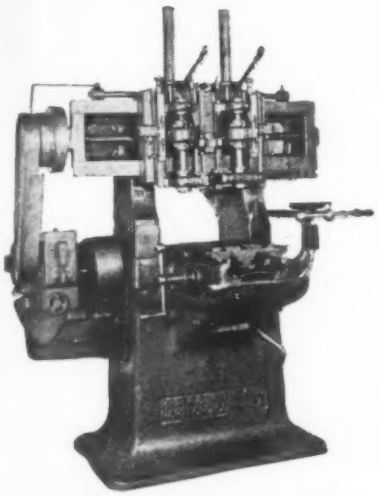
Gray Iron and Semi Steel Castings, also alloyed with nickel, chrome, and molybdenum. Wood, Iron, Brass and Aluminum pattern work.
KING FOUNDRIES, INC.
Phone 823 North Wales, Montg. Co., Pa.
22 Miles from Philadelphia, Pennsylvania

MACHINE SHOP
Facilities include 9" South Bend Bench Lathe, #2 Brown & Sharpe Milling Machine, Drill Press and 8"x8" Shaper. The usual line of hand tools and equipment plus experienced workmanship assure your satisfaction. Your inquiries invited.
C. VANDEGRIFT CO. HOCKESSIN, DELA.

WAREHOUSE STOCK

"FALK" for DEPENDABILITY in Rebuilt Machinery

PROFILER



Pratt & Whitney #12 two spindle motorized profiler. Table 12"x15" equipped with 6" raising blocks, and 5 H. P. 3 ph. 60 cy. 220 V. motor—Turner drive mounted and wired to push bottom control—Rebuilt and guaranteed

MILLING MACHINES

P & W Duplex Miller #2
Becker #7 Lincoln Production Miller
Sanford #1¼ Production Miller, Rotary Table
Cleveland Vertical Miller #1—(New)
Index Universal Vertical Millers (New)
No. 1 Brown & Sharpe Univ. Plain Milling Mach.
No. 1½ American Universal Milling Machine.
1—No. 2 Owens Plain Horizontal Milling Machine.

GEAR CUTTERS

No. 1 ADAMS FARWELL Gear Hobber; complete.
No. 2 WHITON SPUR GEAR CUTTER, Auto.

SHAPERS & SLOTTERS

24" Cincinnati Triple Geared Shaper, Fric. Dr.
20" Steptoe Back Geared Crank Shaper Cone Drive.
20"x20"x24" N-B-P SHAPER-PLANER, arr. M.D.

24" Bullard Rapid Production, M.D.
30" Coburn Vertical Turret Mill, M.D.
3½" Rochester Floor Type Horiz. Boring Mill, M.D.

RADIAL DRILLS

2—Niles, Bement-Pond, flat column 5' arm.
Niles Bement-Pond, flat column 6' arm.

COILING MACHINES

No. 1 and No. 2 SLEEPER & HARTLEY BX CABLE COILING MACHINES ⅜ and ½" cap. Last used for Speedometer cable. Complete.

PUNCH & SHEARS

1—Long & Allstatter Combination Punch & Shear, 1¼" thru 1"—36" throat on punch end, 24" throat on shear end.
WICKES COMBINATION PUNCH AND SHEAR, MOTOR DRIVEN; 1¼" thru 1" Plate; Punching end 48" throat; Shearing end 36" throat; Continuous 6"x1" Plate.
Niagara No. 135 Deep Throat Punch Shear, Hydraulic Wheel Press 200-tons, 42" between strain bars. Self-contained, belt drive.
Niagara 36" foot Shear, 16 ga.
Kutscheid all steel 36"x16 ga. Foot Shear.
Pittsburgh 36"x3/16" Plate Shear, no holddown.
No. 236 PEXTO CIRCLE SHEAR, SPD; 16 ga.
No. 132 BLISS 14 ga., 12" throat, Slitter.
No. 232 BLISS 12 ga., 18" throat, Slitter.
No. 96C Toledo; Twin Geared, Double Geared, Tie Rod Double Crank, Single Acting Power Press, Bed Area 72"x51".
No. 941¼J Toledo Double Crank, Double Geared Twin Drive, Motor Driven Straight Side, Tie Rod Power Press, Bed Area 120"x50".
Toledo 93½J 125 Ton Power Press, Bed Area 95x34, Single Acting, 6" stroke. Double Geared Tie Rods.
Bliss No. 1 125 Ton Power Press, Bed Area 64"x37", Single Acting, 4" stroke.
No. 18, 18C, 19, 19C, Bliss, OBI.
No. 19 Truesdale OBI. Same as 19C.
No. 4 Adriance OBI.
No. 4C
No. 4 MICHIGAN OBI.
No. 6 Waterbury Backed Geared, Open Back.
No. 2 BLISS Back Flywheel Plain, (6).
No. 1—Bliss Back Flywheel Plain.
No. 15N BLISS, arr. Geared, Motor dr. (2).
No. 25N BLISS Geared, Motor dr.; (3).
No. 1 BLISS S.S. Toggle Press.
No. 103S BLISS GANG DIE PRESS; Roll Feed.
3-ton General Flexible Press.
36" NIAGARA 16-gauge Power Squaring Shear, Like New.
No. 30 BLISS ARCH PRESS, Plain.
No. 25 NIAGARA ARCH PRESS, Plain.
No. 71 Waterbury Coining Press, 25 Tons.
No. 93D TOLEDO DRILE. CRANK GEARED S.S. PRESS, Welded Frame.
No. 75 Toledo Open Back Plain Flywheel Press.
No. 2 Niagara OBI.
No. 3 American Can Co. OBI.

GRINDERS

14" Pratt & Whitney Vertical Surface Grinder.
No. 6 Besley Double Opposed Disc Grinder.
No. 2 & No. 3 Brown & Sharpe Cutter Grinder.
Taft-Pierce Automatic Pin Grinder.
Gardner No. 4 Disc Grinder Duble End, 20" disc, 16" ring wheel, ball bearing belt drive.
Badger No. 2 Double End Disc Grinder 16" disc, ball bearing spindle. Universal table.
1—Gisholt Drill Grinder.
Badger No. 2—16" Disc. Dbl. End. Univ. Tbls., Belt.
Gardner No. 1—double end Disc, 12". B.B. belt dr.
Gorton, double end disc grinder, 18" discs.
Sellers drill grinder.
#1 Le Blond tool and cutter grinder.

INTERNAL GRINDER

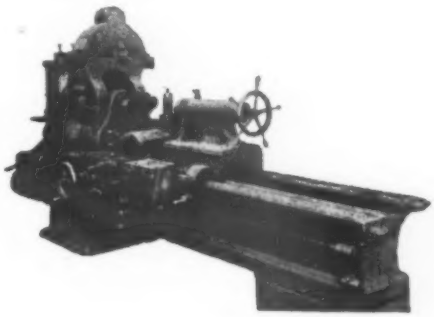
GREENFIELD No. 12, HYDRAULIC FEED, Motor Drive; Cap. swings 15"; Grinds automatically ¾" to 5" dia.; 4" Deep; New in 1928.

TURRET LATHES

1¼" Gridley "F" 4 spindle Automatic Screw Machine.
Milholland Geared Head Hand Screw Machine 1½" cap. Arranged motor drive, now equipped as Milholland Lassiter Staybolt Machine.
Jones & Lamson 3 x 36". Double Spindle, Motor Driven with Air Truck equipment.

LATHES

20 x 10' Mueller Lathe Q.C.G. Taper Attachment, Chuck, Double Back Geared.
30"x12' Putnam Quick Change Gear Screw Cutting Engine Lathe, Arranged Motor Drive.
18x10' Reed Plain Change Lathe.
18"x12' Hamilton Plain Change Lathe.
18x6 South Bend Plain Change Lathe.
16x6 South Bend Plain Change Lathe.



30" x 12' Putnam Quick Change Gear Lathe.
10" x 24" New Logan lathes, with collets, etc.
Lodge & Shipley 26-28" x 21' bed, 14' 6" Centers, Taper Attachment, Pan Bed with Oil Pump.

THREAD ROLLERS

2—#0 Waterbury & Farrell thread rollers.
1—#30 Waterbury & Farrell thread rollers.
2—#22 Waterbury & Farrell cold header & double stroke solid die.
1—#33 Waterbury & Farrell cold headers & double stroke solid die.

TRIMMERS

2—Waterbury-Farrell Automatic Trimmers ⅝ cap.

THREAD MILLERS

Hall Planetary No. 2—24" Swing.
Lees-Bradner No. 8—12"x54.
Pratt & Whitney 6x14.

THREADING MACHINES

1½" Acme Single Head Bolt Threader, like new.
Acme ⅝" Double Head.
Acme 3" Single Head.
Landis 1½" Single Head Bolt Threading Machine.
National 2" Double Head, Geared M. Dr.
Williams 6" Pipe Threading Machine.
Merrill 10" Pipe, Motor Drive with motor.
Curtis Portable 4" Pipe Threading Machine.
Williams 2" Pipe Threading Machine.
Jarecki 2" Pipe Threading Machine.

AUTOMATIC CHUCKING MACHINES

1—No. 24 New Britain type 4 spindle, 5 chucking stations.
1—No. 23 New Britain type 4 spindle, 5 chucking stations.
1—Jones & Lamson Hartness Automatic Chucking Lathe Motor Driven 12" diam., 6" face, 6" width cap.

Buy From Stock

MACHINERY

FALK

MACHINERY CO.,

MERCHANTS

18 WARD ST.

ROCHESTER, N. Y.

Tel. Main 6347

Too Old to Fight?

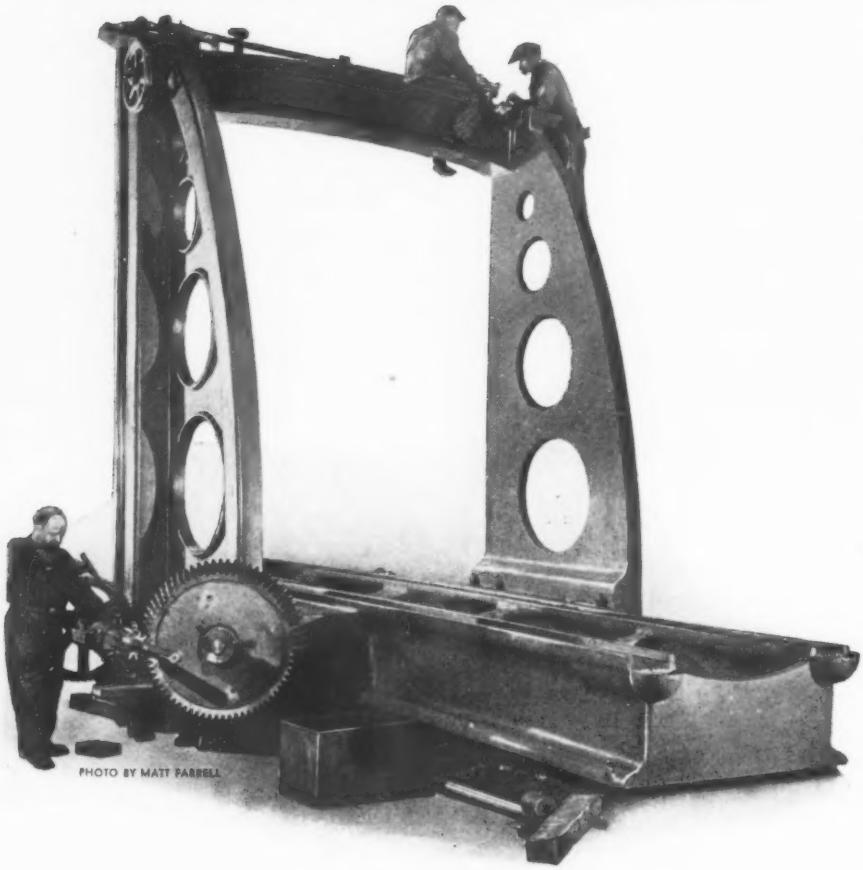


PHOTO BY MATT PARRELL

No machine tool is too old . . . especially in these days when time is the prime factor!

For example, take the case of the 40-year-old 10-foot planer shown above in the process of rebuilding at the Simmons plant. It was completely dismantled and re-assembled from the ground up. Every worn part was replaced.

Today, along with other reconstructed veterans of steel which turn, plane and shape the materiel for final victory, this planer is running again. A similar new tool would have taken many valuable months to complete.

Whatever your machine tool problem, this company has the facilities and experience to serve you.

Awarded to the Employees of Simmons Machine Tool Corp., August 20, 1942. Service Star awarded February 18, 1943.

IN STOCK

Every machine listed in this column is in our warehouse at press time.

- 14" P&W Surface Grinder
- 30" x 16' N.B.P. Geared Head Engine Lathe, Quick Change Gears, 230 V.D.C. Motor.
- 50" x 32' PITTSBURGH Heavy Triple Geared Engine Lathe, Quick Change Gears, 230 V.D.C. Motor.
- 4½" x 30" BARDON-OLIVER Turret Lathe, Geared Head, Motor Drive.
- 24" G&E Spur Gear Cutter, M.D.
- 36" B&S Spur Gear Cutter, M.D.
- 60" B&S Spur Gear Cutter, M.D.
- 50" G&E Spur and Bevel Cutter, S.P.D.
- 90" P&W Spur and Worm Cutter
- 6" PILGRIM Bevel Gear Generator
- 15" GLEASON Bevel Gear Generator
- No. 9 N.B.P. Vertical Miller 39" rotary table, 4" dia. spindle, M.D.
- No. 10 N.B.P. Vertical Miller 42" rotary table, 5" dia. spindle, M.D.
- 30" x 30" x 10' NEWTON Slab Miller horizontal arbor, M.D.
- 48" x 48" x 20' PATCH Planer, 4 heads, 230 Volt D.C. Rev. Motor Drive.
- 60" NEWTON Portable Slotter, 230 Volt D.C. Rev. Motor Drive

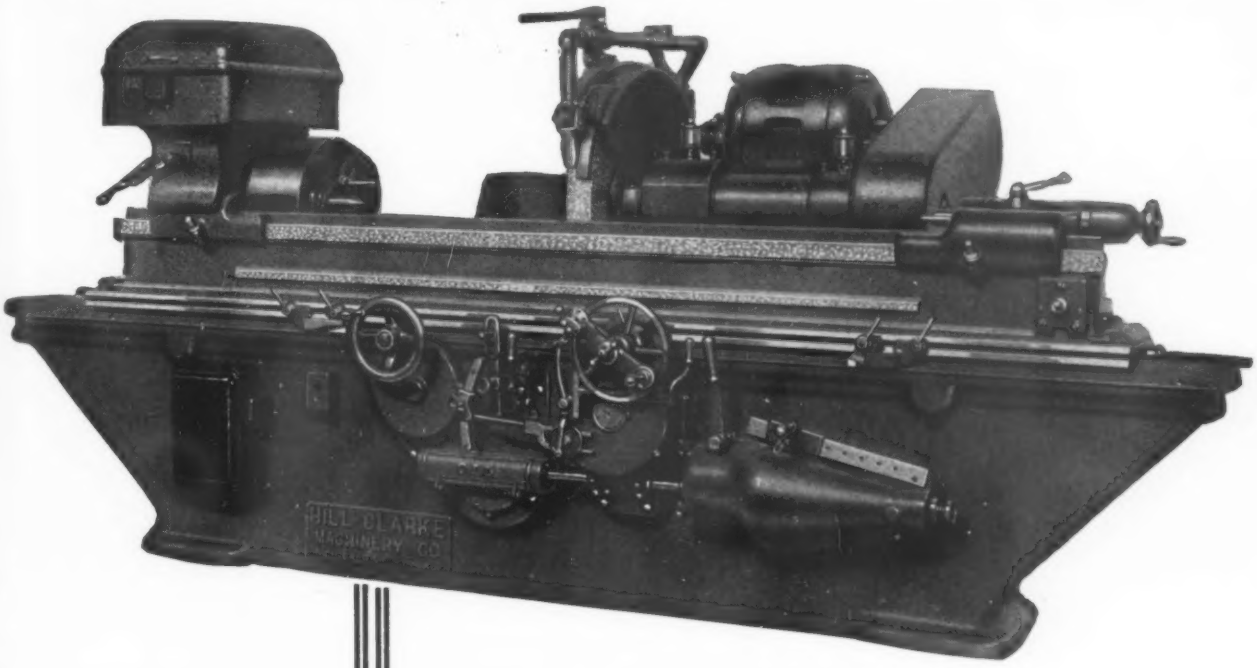
Write TODAY for the new book "THE SIMMONS WAY" *of Rebuilding.*

SIMMONS ENGINEERED *Machine Tool* REBUILDING

SIMMONS MACHINE TOOL CORPORATION

Main Office and Plant: **1759 N. BROADWAY, ALBANY, N. Y.**

New York Office: **149 BROADWAY**



SIZES AVAILABLE

10x36
10x50
10x72
14x36
14x50
14x72
14x96
16x50
16x72
18x96

●

We can now Modernize and Motor a limited number of your NORTON Grinders.

MICRO-FINISH WITHIN PRECISION LIMITS WITH STANDARD GRAIN WHEELS

assured by

HILL-CLARKE *Modernized Motor Driven* CYLINDRICAL GRINDERS

Refinements incorporated by Hill-Clarke in these machines assure precision, minimum vibration and a finish which requires no extra grinding time. Even when using standard grain free-cutting wheels, these machines can be depended on for super-grinding and micro-finish.

Among the modern features offered in these machines to insure performance which meets today's exacting demands are the following Hill-Clarke developments.

. . . Multiple V-belt drive from constant speed motor to work head.

. . . an accurately fitted wheel slide having a ball bearing mounted feed screw—a refinement which assures sensitive wheel control and makes possible the duplication of work to extremely close limits.

. . . sheaves and motors dynamically balanced to insure smooth, vibrationless performance.

. . . mounting of coolant pump on a separate multiple compartment settling tank as a further means of eliminating vibration.

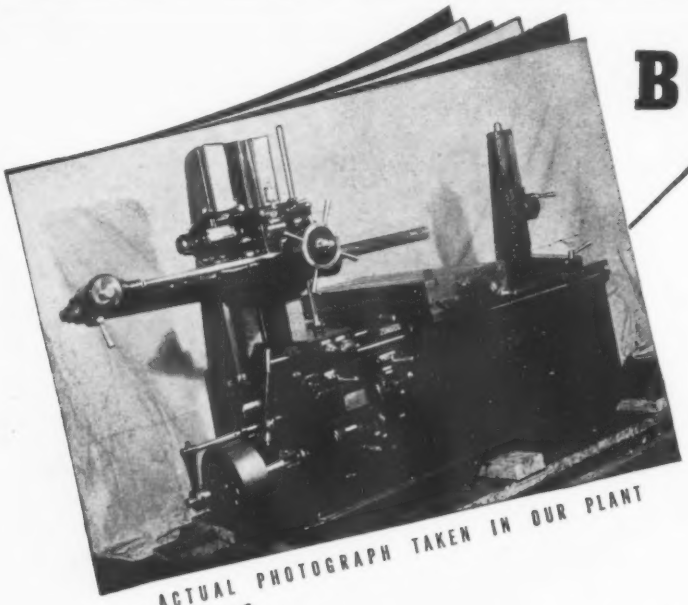
Other details of design and refinements are fully covered in illustrated bulletin "Super Grinding"—available promptly on request.

HILL-CLARKE MACHINERY CO. CHICAGO U.S.A.

HILL-CLARKE MACHINERY CO.

649 WASHINGTON BOULEVARD — CHICAGO, ILL.

PHONE: HAYMARKET 7660 — CABLE ADDRESS "REMAND"



ACTUAL PHOTOGRAPH TAKEN IN OUR PLANT

BORING MILLS

2½" CLEVELAND HORIZONTAL BORING MILL

Single pulley drive, table size 20" x 42", 2½" spindle diameter; equipped with geared power feeds and with mechanical reverse to bar, travel of the bar 23", power vertical adjustment of head 18", hand longitudinal feed to saddle 36", power transverse feed to table 30".

4" BEMENT MILES HORIZONTAL BORING MILL

Knee type; cone driven, backgeared; working surface of cross table 24½" x 42", with hand longitudinal and cross travel; length of main table 6 ft., supported on two screws, raised and lowered by power or hand, with outer support; 48" travel to bar (in two shifts) through automatic reversible feeds or by hand adjustment.

● We have hundreds of high grade used and rebuilt machine tools in stock. Wire, write or phone us your requirements.

See our other listings on another page.

INDIANAPOLIS MACHINERY & SUPPLY CO.

INCORPORATED

STEEL · ELECTRIC MOTORS · STARTERS · CONTROLS *Machine Tools* MILL · MINE · SHEET METAL SUPPLIES

INDIANAPOLIS, INDIANA

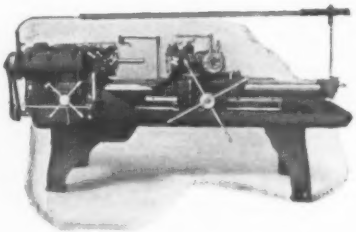
EASTERN BRANCH AND EXPORT OFFICE, 44 WHITEHALL STREET, NEW YORK CITY

TURRET LATHES

For Immediate Delivery

2–24" STEINLEE LATHES

Price $1450 each



1—2¼" x 24"
JONES & LAMSON LATHE
Price $1000

1—2-Spindle
JONES & LAMSON LATHE
Price $1250

LOUIS E. EMERMAN & CO.
871 W. 120th St. Chicago, Ill.

OVER THIRTY YEARS EXPERIENCE REBUILDING MACHINE TOOLS

24" Bullard New Era Vertical Turret Lathe, M.D.
52" Baush Vertical Boring Mill
12" Bullard Mult-Au-Matica
2½' American Plain Radial Drill
#2½ Bilton Auto. Gear Cutter
12"x18" Norton type B Semi-Automatic Plain Grinder, M.D.
14"x36"–42" Norton type B Model 81 Crank Pin Grinder
24"x96" Landis Roll Grinder
#72 Heald Internal Centerless Grinder, M.D.
#0 Manville SSSD Header
#4 Manville SSSD Header
#00 Manville DSSD Header
#2 Waterbury Farrel DSSD Header
#2½ Waterbury Farrel DSSD Header
#3 Manville DSOD Header
16"x10' LeBlond Lathe
5" Pratt & Whitney Automatic Miller
#10 Bilton Productomatic Miller
#3 Brown & Sharpe Plain Miller
#2 Cincinnati Vertical Miller
24"x24"x8' Gray Planer
Bliss Eight Roll Tube Forming Roll
⅞" Cleveland Model M. Auto Nut Machine
#3 Waterbury Farrel Gang Slitter
8" Betts Vertical Crank Slotter
#2 Manville Auto. Screw Thread Roller
#3 Manville Auto. Screw Thread Roller
2¼"x24" Jones & Lamson Geared Head Turret Lathe
#3 Manville Automatic Bolt Head Trimmer
#375C Manville Automatic Bolt Head Trimmer
#312C Manville Automatic Bolt Head Trimmer
#4 Manville Automatic Bolt Head Trimmer
#500C Manville Automatic Bolt Head Trimmer
#506C Manville Automatic Bolt Head Trimmer

J. L. LUCAS & SON, INC.

Bridgeport **Connecticut**

HERE'S a good idea of the way O'Brien functions as a single source of supply for all your equipment needs: A customer wanted a complete power plant. We found what he desired down to the smallest pump . . . steel buildings, 2-500 H.P. boilers with stokers, coal and ash handling equipment, boiler feed pumps, feed water heater, all piping and accessories. Plus 937 KVA and 1875 KVA steam turbine generator sets, complete with condensers, pumps; switchboards. Plus a complete production and maintenance machine shop. Plus a 100 ft. steel stack and a 50,000 gal. steel water tank on steel supports. We purchased the entire plant, dismantled it, sold it to the customer and shipped it 500 miles. The complete plant was re-erected at destination under O'Brien supervision. In 5 month's time the plant was running without a hitch in its new location. If you want to buy or sell a complete plant or order a few machines—call O'Brien.

ONE SOURCE . . . ONE RESPONSIBILITY

A Selected List of Current Offerings—Subject to Prior Sale

MACHINE TOOLS

BOLT CUTTERS—1½" Acme with Landis head, belt drive.
2½" Landis, motorized with motor.

DRILLS—5' Bickford Radial, 13" column, mtr. drive.
4 spindle Leland Gifford B.B. Sensitive, #2 taper, tapping attachment.
16" Henry & Wright, belt drive, Sensitive, B.B. #2 M.T.
16" Edlund belt drive, Sensitive B.B. #2 Morse T.
8 spindle Baush, belt drive, 36" diam. head #4 M.T.

GRINDERS—#6 Bryant Internal Grinder, 12" swing, belt drive.
Springfield Planer Type, Surface, cap. 12"x50".
18" Gorton Disc Grinder, belt drive, two universal tables.
6"x18" Landis, plain, self-contained, motor drive.

LATHES
26"-48"x18' McCabe, double spindle, belt drive, 12' centers.
20"x8' Boye & Emmes, belt drive d. b. g. quick change.
18"x14' Hamilton belt drive, quick change.
18"x12' LeBlond, belt drive, plain change gear.
16"-23"x8' South Bend Gap Lathe, belt drive.
16"x6' Pratt & Whitney, quick change, belt drive taper attachm't
14"x6' American, geared head, engine lathe, single pulley drive, quick change.

LO-SWING
3½"x60" Fitchburg Lo-Swing, motor drive, 2 carriages.

MILLERS—#2 Brainard Plain, belt drive, table 8"x30".
Hendey "Lincoln" type Production Miller, table 9"x30", belt drive.
#1 U. S. Hand, belt drive, table 5"x20".
Newton Planer type 15" between the uprights, table 14"x54".
3-Cincinnati Plain Millers, belt drive, table 12"x34", traavel 18".

#3 Lees-Bradner Thread Miller, capacity 3", diameter 6" long. It will also cut internal threads, motor drive. Immediate delivery.

PLANERS—24"x24"x6' Putnam, belt drive, 1 head.

SHAPERS—24" Barker, single geared, belt drive.
20" Barker, back geared, belt drive.

SLOTTERS—6" Newton, belt drive, 18" table.
10" New Haven, belt drive, 24" table.

TURRETS—#3 Foster, arranged for bar work, 1¼" cap. belt drive.

WHEEL PRESSES
200 ton Caldwell, 38" between bars, motor drive, with pump.

Everything from a Pulley to a Power House

THE O'BRIEN MACHINERY CO.

PHILADELPHIA'S LARGEST MACHINERY DEALERS AND EXPORTERS

113 NORTH THIRD STREET • PHILADELPHIA - PENNA.

BELL TELEPHONE: MARKET 4180 CABLE ADDRESS: OBRIEN-PHILA

MILLERS:

3—New Improved Briggs Type A Production Millers—Hydraulic Feed
1—Pratt & Whitney 6" x 48" Thread Miller
7—Pratt & Whitney 12" Automatic Millers with receding tables
1—Cincinnati 28" Plain Miller—Semi-Auto. Miller with Intermittent Feed and Power Quick Return
1—Becker #7-H Lincoln Type Millers
1—Becker Model C Vertical Miller—M. D. Table 55 x 14"

LATHES:

1—Fitchburg 8" x 108" Lo-Swing Lathe—2 carriages
1—Bullard 24" Vertical Turret Lathe
1—LeBlond 14" x 8' QCG DBG Engine Lathe

UPSETTERS:

1—Ajax 4" Upsetting Forging Machine
1—National 4" Heavy Duty Forging Machine

DRILLS:

1—Fosdick Machine Tool Co. 5' Full Univ. M. D. Radial Drill
1—Hammond 4' Sensitive Radial Drill
1—Aurora 35" Sliding Head Upright Drill

MISCELLANEOUS:

1—Gridley 2¼" Single Spindle Auto. Screw Machine with large tool assortment.
1—Gardner #24 53" Horizontal Disc Grinder
1—Waterbury-Farrel #6½ Double Crank Press, 90-ton capacity. Crankshaft 5"

The items in this advertisement are only a partial listing from a large stock available for immediate shipment. Your inquiries for other machine tools will have prompt attention.

OK'd by "BOTWINIK" to KO your production problems

Botwinik Rebuilding Service is helping many of America's war industries by rebuilding their equipment to fit into today's super-production demands. A "Botwinik" time-and-money-saving service worth investigating.

1—Lodge & Shipley 16" x 8' QCG Engine Lathe
New Lyon-Robbins 14" x 8' Gear Head Engine Lathes
1—Johnson 30 x 24 Triple Geared QCG Engine Lathe
1—Sellers #709 Engine Lathe. Swing 36" x 19'
1—Bridgeford 26" x 12' Heavy Duty M. D. DBG QCG Engine Lathe

HAMMERS:

1—E. W. Bliss 600-lb Board Drop Hammer
1—Bradley 80-lb. Rubber Cushioned Helve Hammer
1—Bell 600-lb. Steam Hammer and base
1—Chambersburg 1200-lb. Board Drop Hammer
1—Bell 850-lb. Steam Hammer—Guide Ram Type

1—Bement-Niles 17" Traveling Head Shaper—Length of bed 6'5"
1—Fellows 36" Gear Shaper
1—Goss & DeLeeuw 6" 5-spdle. Chuck'g Machine—arr. for M. D.
2—Bilton #2½ Gear Cutters
3—Bilton # 1 Gear Cutters
1—Nilson # 4 Four Slide Wire Former
3—Pratt & Whitney #14 2-spdle Profilers—M.D.
2—Leland-Gifford 2-spdle Profilers
1—Newark 3 x 36" Gear Cutter incr. to take larger diam.
1—W. W. Sly No. 00 Sand Blast Outfit 32" diam. x 48" sand tank. Equipped with Norbide Nozzle
1—Pratt & Whitney #3 Die Sinker
1—Niles 12" Vertical Slotter
1—Pratt & Whitney 2-Spdle Gun Barrel Reaming Machine
1—Pratt & Whitney 4" 2-Spdle Centering Machine

Botwinik Brothers of Mass. Inc.

94 GOLD STREET WORCESTER, MASS.

GOOD MACHINES

Immediate Shipment!

NILES 8' Boring Mill; 2 Swivel Heads.
DIAMOND #4—16" x 60" Surface Grinder.
LAPOINTE #3 Duplex Broach.
BULLARD 7" Mult-Au-Matic; M.D.
GREENFIELD #52 Hydroil Internal Grinder.
POND 84" x 72" x 20' Planer; 4 Heads, M.D.
GRIDLEY 2¼" Single Spindle Automatic.
JONES & LAMSON 3" x 36" Flat Turret Lathe.
CINCINNATI BICKFORD 6' Semi-Univ. Radial Drill Aux. Table.

Send for Complete Listing

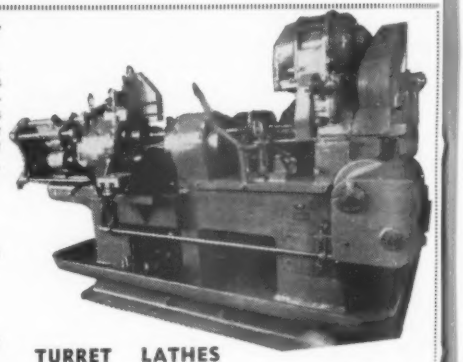
ACME EQUIPMENT CO. MDNA MEMBER

128 So. Clinton St., CHICAGO, ILL.

Phone ANDover 3431

4½" CLEVELAND 4-SPDL. AUTOMATIC CHUCKING MACHINE

silent chain motor drive with 15 HP Gen. Elec. 3/60/440, 1200 RPM motor with switch and pushbutton station; independent cross slides; each spindle equipped with air cylinder; equipped with miscellaneous gears, vertical tool slide, 3 tool-posts, coolant pump and piping; weight approx. 10,000 lbs.



AUTOMATICS

4" Cone, 4 spdl. automatic, s.p.d.
½" Davenport, m.d.
⅞" Cleveland, Model A
4½" Clevelands 4 Spdl. Chuckers, M.D. (2)
No. 452 New Britain Chucker, M.D.
2" Cleveland Model B (2)

MILLING MACHINES

1B Brown & Sharpe Milling Machine.
1½B Kearney & Trecker Universal Milling Machine.
No. 3 Kearney & Trecker Vertical Milling Machine.
Kent-Owens Hand Milling Machine.
#3 Frew Hand Milling Machine.
#3 Cincinnati Milling Machine.

TURRET LATHES

3—2A Warner & Swaseys
2—2L Gisholt, m.d.
4D Potter & Johnson
Timken Bearing

MDNA MEMBER

VICTOR Machinery Co.

135 S. Clinton St. ('Phone—CENtral: 3139) CHICAGO

3—Potter & Johnson No. 6A Turret Lathes, M.D., Gridley Automatics ¾" to 4¼"

LARGE LATHES

48"x26' Miles Lathe.
48"x12' Harrington Gap. sld. bed.
26"x13' Boye & Emmes
26"x14' Rahn-Larmon raising blocks to 34"
24"x14' Rahn-Larmon

AARON MACHINERY CO.
45 CROSBY STREET NEW YORK, N.Y.

MISCELLANEOUS MACHINES

30x30x12' Gray Spur Grd. Planer, m.d.
12x18" Cinci. Plunge Cut Grinder, m.d. with 9" face wheel, and oscil. att.
3' Carlton Sensi. Radial, with tapping att.
6' Niles Plain Radial Drill
4-spindle Henry & Wright High Speed Drill
Gisholt Tool Grinder, arr. for m.d.
10"x10" Napier Metal Band Saw
⅜" Shuster Wire Straightener & Cut-off Machine
½" Shuster Wire Straightener & Cut-off Machine

STRONG, CARLISLE & HAMMOND COMPANY

1392 West 3d St. Cleveland, Ohio
2832 E. Grand Blvd. Detroit, Mich.

BORING MILL 60" N.-B.-P., R.P.T., M.D.
BORING MILL 84" N.-B.-P., R.P.T., M.D.
GEAR PLANERS, Bevel, 36" & 54" Gleason, M.D.
GRINDER, Surface, UK-500 Hanchett 24"x10" M.D.
LATHE, 36" x 32' American Grd. Hd., Q.C.G., T.A.
LATHE, Turret 34" Gisholt, 4¼" H.S., M.D.
PRESS, Dbl. Crk. 95-B Toledo, bed 55"x54".
PRESS, Toggle No. 14 Bliss, stoke 18".
PRESS, Hydr., 1000 ton Wood, platen 42" x 9'.

LANG MACHINERY COMPANY
28th St. & A. V. R. R. Pittsburgh, Pa.

12" x 96" LANDIS Plain Cylindrical Grinder. Automatic Feed Machine.
28" x 24" x 24" stroke CINCINNATI SHAPER COMPANY Crank Planer.
One head on rail, arr. for double tool blocks.
ALSO MANY OTHER TOOLS

ALEX ZEEVE & COMPANY
2269 Woolworth Building New York, N. Y.

USED and REBUILT MACHINERY FOR SALE

LATHES
Lathe & Morse 26" x 12'
Pittsburgh Q.C. M.D. 26" x 10'
Adams, G.H. 14" x 5'

MILLERS
#12 Brown & Sharpe Production
Pratt & Whitney, Table 6 x 32"
#3 Garvin Duplex, Table 12 x 64"
4" Bickford Horiz. Boring Mill S.P.
2" Binsee Horiz. Boring Mill

GRINDERS
Modern, Cylindrical, 16 x 60" M.D.
Crocker-Wheeler Disc Grinder
#3 Van Norman Relio, Cylindrical M.D.
Diamond Surface, 12 x 14 x 54"
Diamond Surface, 16 x 16 x 56"
#16 Blanchard

PLANERS
American, 36 x 36 x 8' M.D. 2 Heads
Whitcomb, 24 x 24 x 6'
Gould Machine Co. 18 x 12 x 36" Table 14½ x 36"

AUTOMATICS
#52 National Acme, ¾" Cap. 4 Spindle, M.D.
#53 National Acme, 1" Cap. 4 Spindle,
#55 National Acme, 1⅝" Cap. 4 Spindle, M.D.
Gridley, Model G, 1¼" Cap.
Gridley, Single Spindle, 2¼" Cap.
Gridley, 4 Spindle, 2¼" Cap.
New Britain, 6 Spindle, 1⅝" Cap. M.D.

TURRET LATHES
Gisholt, 21", 2¼" thru spindle
Gisholt, 5¾", thru spindle
#3 Pratt & Whitney, 2¼" Cap.
#6 Brown & Sharpe, 2" Cap.
Bullard Vertical Turret Lathe, 24"
American Fox Monitor Lathe
#4 Acme Turret Lathe

DRILL PRESSES
Eberhardt, 24" Sliding Head
Foote Burt, Heavy Duty, 2" Cap. S.P.D.
21" Cincinnati Drill Press, with tapping attached.

SHAPERS
10" G & E M.D.
14" Whipp
16" Whipp
18" Robur
24" Rockford M.D.

GEAR CUTTERS
G. E. 3 x 36" Spur
G. E. 36"

ALSO
Niagara Power Press #66-E
Niagara Squaring Power Shear 14 Gauge
Niagara Sheet Metal Shear
Dreis & Krump Brake
#17 Williams & White Heavy Duty Punch, M.D. 36" throat
Beasley Ball Bearing Grinder, 16"
Form Rolling Machines, 4 sets of Form Rollers
Thompson Spot Welder, 50 KVA Air Operated.
10" & 12" Newton Slotters
George J. Ohl Power Shear 10'. 14 Gauge
Radiac Cutoff
Atkins & Racine Hacksaws
Oster Threader
Standard 2" Bolt Cutter

Send Us Your list of Idle Machinery We will put it to War Work

S. & S. MACHINERY CO.

207 CENTRE STREET — Phone: WOrth 4-5710 — NEW YORK, N. Y.

PROMPT DELIVERY

AUTOMATICS
7" Baird 6 spindle
6"x6¾" Goss & DeLeeuw
4½" Gridley model H
1⅝" National Acme No. 55
14" Fay
No. 6A Potter & Johnston
1" Cleveland Model J
No. 16 Gisholt Simplimatic

GEAR MACHINERY
No. 16 HS Gould & Eberhardt hobber
No. 12 Barber Colman hobber
No. 1 Lees Bradner hobber
26"x8" Brown & Sharpe automatic
24"x12" Flather automatic
36"x6" Gould & Eberhardt automatic
48" Brown & Sharpe automatic
60" No 5A Cincinnati automatic
18" Gleason testers & lappers
15" Gleason spiral gear roughers
15" Gleason spiral pinion roughers
18" Gleason bevel gear generator
2 spindle Lipe chamferer
Pratt & Whitney worm grinder
National gear checker

LATHES
28" Steinle, 8" hole
24" Gisholt, 6½" hole
24" Steinle, 6¼" hole
22" Libby, 4½" hole
2¼x24 & 3"x36" Jones & Lamson
No. 1 ⅝" capacity hand screw
Nos. 4 & 5 Foster
13"x6' Automatic threading
Melling crankshaft 6 cylinder
3¼"x36" & 4"x36" Lo Swing lathes
27"x14' Bridgeford heavy turning or axle 2 carriage
8" Sundstrand stub
9" Sundstrand Mfg.
1"x18" Pratt & Whitney automatic
14"x6' Lodge & Shipley with turret on carriage
22"x24" American with turret slide

GRINDERS
10x36 10x50 and 14x50 Norton
12x36 12x52 16x48 and 16x60 Landis
Capitol internal
Nos. 6 & 15A Bryant internal
20"x50" Safety surface
Nos. 50 & 60 Heald cylinder
18" 24" & 30" Gardner disc
24" No. 84 Gardner opposed disc
24" No. 221 Hanchett opposed disc
20" No. 120A Gardner opposed disc
17"x36"-48" Norton hydraulic crankshaft
Gisholt tool grinder
24" Ingersoll face milling cutter grdr.
30" Ransom elec. snagging
16" Norton snagging
No. 575 Hawes tube polisher
18" Whitney wet tool
36" No. 5TGM Bridgeport wet
Cincinnati face milling cutter grinder
Pratt & Whitney grinder for worms

MILLING MACHINES
No. 3 Turnmilling for round work
Nos. 1 & 1A Davis & Thompson drum type duplex
48" Oesterlein tilted offset
Nos. 10 & 45 Productomatics
5" and 12" Pratt & Whitney automatics
Model AB Becker vertical
Type C Hall planetary thread miller
Taft Pierce thread miller
28" Cincinnati Duplex
3⅞" Beaman & Smith horizontal boring mill
36" Garvin cam & form miller

PLANERS
24"x24"x5' Gray
24"x24"x6' Woodward & Powell
29"x29"x6'3" New Haven
36"x36"x10' Betts 2 heads
56" Morton draw cut shaper

SEND FOR STOCK LIST.

MILES MACHINERY CO.
SAGINAW, MICH.

BOLT AND PIPE THREADERS—1½" & 3" National; 10" Saunders Pipe; 2½" Landis Bolt, M.D.

BORING MILLS—10' Betts Heavy Duty, 108" table, M.D.; 72" Betts, M.D.

RADIAL DRILLS—6' Cinci. Bickford Pl. Gear box; 5' N.B.P. Univ. Gear Box; 4½ Morris Pl. Gear Box.

CHUCKER—#34 New Britain.

GRINDERS—30" x 240" Landis Cyl. 24" Bridgeport Disc D.C., M.D. 24" x 96" Landis Cyl. 20" x 96" Landis Cyl.; 14" x 96" Cinci. M.D.; 12" x 96" Landis; 12" x 120" Landis; #6 Landis Internal.

GEAR CUTTERS—11" & 6" Gleason Bevel Gear Generators; 36" G & E Spur and Bevel; 36" Newark Spur, new 1928; 36" x 10" Cinci. Spur.

KEYSEATERS—#6 Catlin 40" stroke x 5" wide; #6 M. & M. 31" stroke x 3½" wide.

PLANERS—48" x 48" x 16' Cinci., 4 hds., M.D.; 36" x 36" x 12' Putnam, 3 hds., M.D.; 27" x 6' Woodward Powell, M.D.

LATHES—32" x 12' Pittsburgh, Q.C.G. blocks to 44"; 36" x 16' Bridgeford Grd. Hd., T.A.; 64" x 28' New Haven; 18" x 6' Greaves Klusman Grd. Hd.

ROSENKRANZ MACHINERY CO.
30 Church Street — New York, N. Y.

IF YOU ARE DOING DEFENSE WORK

Send for Our Latest Circular Covering Bargains in Small Tools Such as Drills, Reamers, Turret Attachments, etc.

DEWITT TOOL COMPANY
173 Grand St. — New York City

New "SEARCHLIGHT" Advertisements

Received by 10 A. M. Monday will appear in the issue out Thursday of the following week, subject to limitations of space available.

Departmental Staff
AMERICAN MACHINIST
330 W. 42nd St. — New York

POWER PRESSES
BLISS, TOLEDO, V & O, ETC.
REBUILT — GUARANTEED
JOSEPH HYMAN & SONS
Tioga, Livingston and Almond Streets
Philadelphia, Pa.

GUARANTEED USED MACHINE TOOLS

DRILLS

4 spdl. Sigourney (4)

4 spdl. Henry & Wright (19)

MILLERS

26" x 36" x 10' Ingersoll

26" x 25" x 12' Ingersoll

GEARS CUTTERS

No. 60BM Gould & Eberhardt Bevel Gear Rougher (2)

GRINDERS

(See page 267, Hill-Clarke Cylindrical grinders)

No. 40 Bryant Plunge Cut, Wide Wheel, Oscillating

No. 10 Lees-Bradner Spur Gear Grinder 1½" dia. New Yankee Drill Grinder

TURRET LATHES

18" Libby

HILL-CLARKE MACHINERY CO.
649 Washington Boulevard
Chicago, Illinois

OTT MACHINERY SPECIALS

AUTOMATICS, Gridley, 2¼, 3¼, 4¼ & 5½" S.S.
AUTOMATICS, Gridley, 1¼ & 2⅝" Model F
AUTOMATICS, Cleveland, 2" 18" feed Model B
AUTOMATICS, Cleveland, ⅞ & 2⅝" Model M
AUTOMATICS, Cone, 2½" 4 spdle., M.D.
AUTOMATICS, #22, 23 & 24 New Britain
AUTOMATICS, Potter & Johnston #5A & 6A
GRINDERS, Norton, 14x36" Plain, M.D.
GRINDERS, Cincinnati #2 Universal
LATHE, Putnam, 60"x17' with 12" Riser Blocks, total swing 85" M.D.
LATHE, 3x36" J.&L. Dble Spdle.
LATHE, Sundstrand, 8" Stub, M.D.
MILLING MACHINE #3½ Pratt & Whitney Duplex, M.D.
MILLING MACHINES, Craftsman #1 & 2
PLANER, Gray, 42"x42"x12', 3 Heads, M.D.
PLANERS, 36x36"x10' Hamilton 2 Heads, M.D.
PLANERS, 42x42"x12' Ohio, 1 Head, M.D.
PRESSES, Toledo, #34 Solid Back, S.G.
PRESSES, Toledo, # 2 to 5 Open Back Inclinable
PRESSES, Ferracute, P2, 3 & 4, Solid Back

OTT MACHINERY SALES, INC.
542 Second Ave. Detroit, Mich.

By order of the Owners—we will sell at

ABSOLUTE PUBLIC AUCTION MACHINERY AND EQUIPMENT

of the

AMERICAN SURPLUS MACHINERY CORP.

On The Premises: 529 East Jefferson, DETROIT, MICH.

Tuesday, April 20, 1943 at 11:30 A.M.

Partially Comprising:

BORING MILLS: 42" Bullard, 42" Gisholt, M.D.
MILLERS: Model "SD" and Model "C" Becker Verticals
30" NEWTON ROTARY, Double head
3½" PRATT & WHITNEY DUPLEX MILL, motor driven
AUTOMATICS: 2" Cleveland, Model B. 5½" Gridley, single spindle, #55 Acme.
LATHES: 16"x6' P & W, S.Q.C., 16"x12' Sidney, Q.C.G.
RADIAL DRILLS: 2' American, 3' Prentice Plain Radial Drills.
14"x36" Norton Plain Grinder, M.D.
#7 FELLOWS High Speed Gear Shaper
E-4 KELLER ENGRAVING MACHINE, M.D.
#12 BARBER COLMAN Single Overarm HOBBER, M.D.
SAUNDERS PIPE MACHINE, 2½" to 8" M.D. . . . and various other small tools

INSPECTION: APRIL 15TH TO DATE OF SALE
SEND FOR FREE DETAILED & DESCRIPTIVE CIRCULAR

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INDUSTRIAL PLANTS CORPORATION
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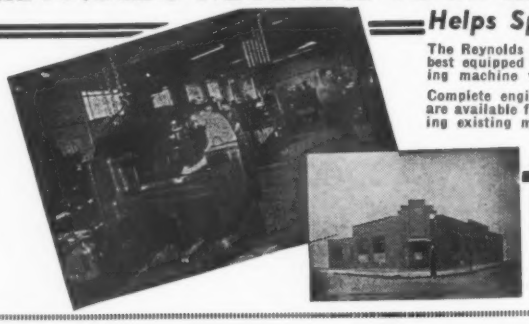
Helps Speed War Production



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1⅜", 1¾", 2¼" Gridley 4 spindle, M.D.
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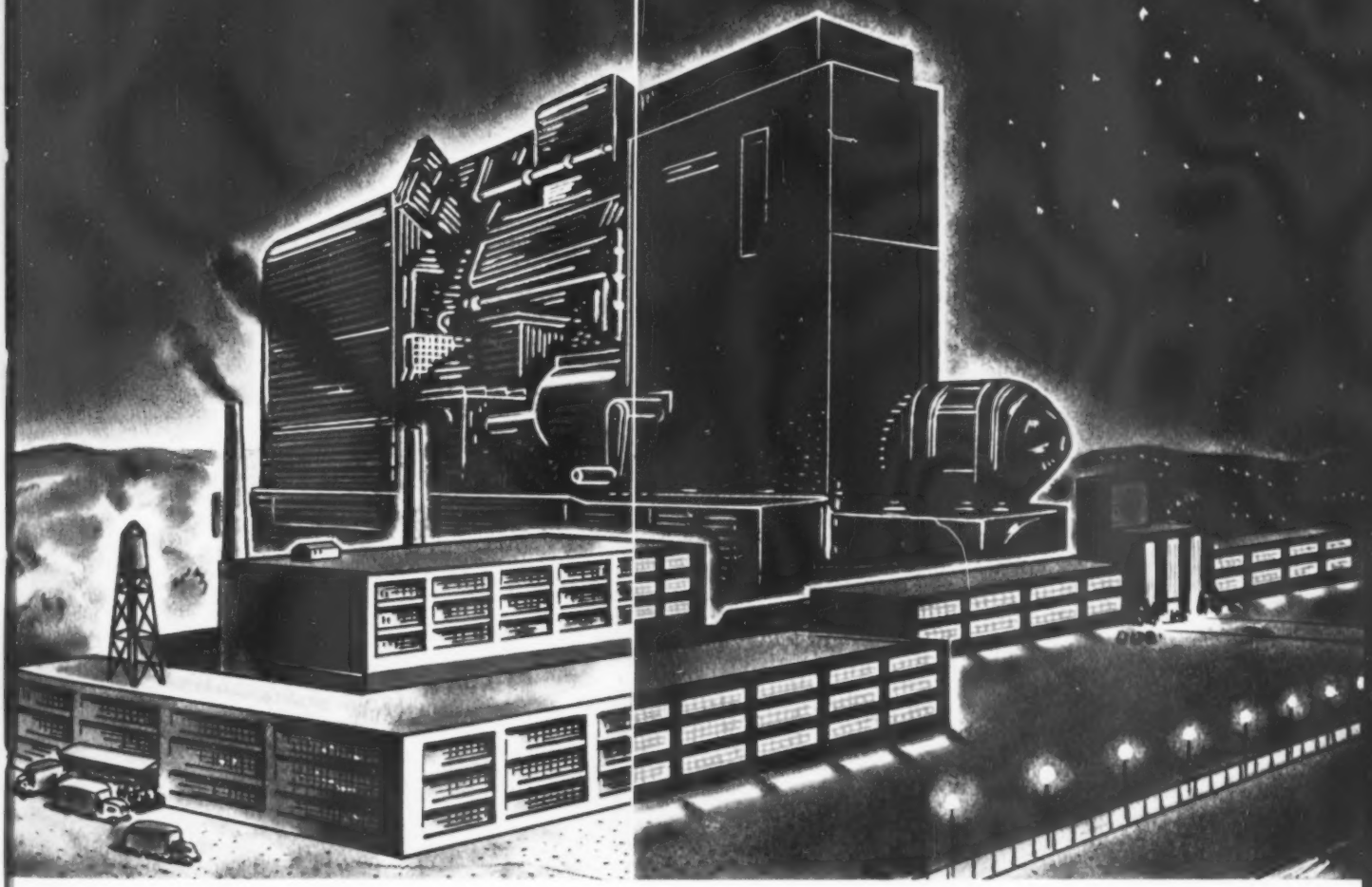

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Graph-M.N.S.	Air	Shallow	Easy Machining Long Wearing Non-seizing

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